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THE ORIGINE OF FORMES and QUALITIES,

(According to the *Corpuscular Philosophy*)
Illustrated by *CONSIDERATIONS*, and *EXPERIMENTS*.

(Written formerly by way of *Notes* upon an *Essay* about NITRE.)

The Second Edition,
Augmented by a Discourse of Subordinate Formes.

By the Honourable
ROBERT BOYLE
Fellow of the *Royal Society*.

Audendum est, & Veritas investiganda; quam etiamsi non assequamur, omnino tamen propius, quàm nunc sumus, ad eam perveniemus. Galen.

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ROBERTUS SAY,

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The Publisher to the Ingenious Reader.

IN this curious and inquisitive Age, when men, altogether dissatisfied and wearied out with the wranglings and idle speculations of the Schools, are with equall zeal and industry so earnest in their quest and pursuit of a more solid, rational, and usefull Philosophy, it may prove a work very obliging and meritorious to help and guide them in their studies and researches, and to hang out a Light to them, (as the Ægyptians used to do from their highly celebrated Pharos, for direction to the Mariners, that sailed in those dangerous Seas neer Alexandria) whereby they may, with better successe, steer their course through the vast Ocean of Learning, and make more full and perfect Discoveries of hitherto unknown Philosophical verities: which has been the chief Design of this Gentleman of Honour, the most excellent and incomparable Author in this Treatise now presented to your view, wherein Principles are not (as was the mode and guize of former times) obtruded on the World upon the account of a Great Name, or involved in cloudy and mystical Notions, which put the Understanding upon the Wrack, and yet when with all this labour and toile of the Brain they are at last known, prove impertinent and useless to the making out with satisfaction, or so much as tolerably, the ordinary Phænomena, which Nature every day presents the world with, but such as are built upon the firme and immoveable foundation of Reason, Sense, and Experience, plain and obvious as well to the Eye as to the Understanding, and no lesse accurate and certain in their Application. And though the most noble Author hath herein, for the main, espoused the Atomical Philosophy (corrected and purged from the wild fancies and extravagancies of the first Inventours of it, as to the Origine of

the Universe, *and still imbraced with so much kindnesse and tenderneſſe by some* Pretenders, *against which He hath so Learnedly disputed in his first part* Of the Usefulneſſe of Experimentall Philosophy, *p.*74. *&c.*) *in explicating the Appearances; yet considering the several Alterations and Additions* (*the happy product of his penetrating judgment*) *made therein, I may not scruple to call it a New* Hypotheſis, *peculiar to the* Author, *made out by daily Observations, familiar Proofs and Experiments, and by exact and easily practicable* Chymical Proceſſes, *whereby one of the most abstruse parts of* Natural Philosophy, *the* Origine of Formes and Qualities, *which so much vexed and puzzled the* Antients, *and which, I would speak with the leave of the* Carteſians, *their* Ingenious Maſter *durst scarce venture upon, or at leaſt was unwilling to handle at large, is now fully cleared and become manifeſt: so that from this very* Eſſay *we may well take hope and joyfully expect to see the noble* Project *of the famous* Verulam (*hitherto reckon'd among the* Deſiderata) *receive its full and perfect Accomplishment, I mean, a real, uſeful, and experimental* Physiology *eſtabliſhed and bottomed upon easie, true, and generally received* Principles: *But I shall not foreſtall thy judgment either about the Excellency of the Author, or his Subject, who hath so freely communicated to the World those* treaſures *of* Learning, *wherewith his Mind is enriched, but shall soon referre you to the* Work *it self, after I have given you these few Advertiſements.*

The following Diſcourse (*as is easily perceivable by divers Paſſages thereof*) *being written several years since whole and entire, as now it is, I know not whether it will be worth while to intimate, that the* Author, *casually turning over of late a very recent* Chymical Writer, *found in one of his Treatiſes* (*divers of which he never to this day read over*) *a part of the* Fifth Experiment *of the second Section; but, as He profeſſes,* (*and sure is like to be believed*)

lieved,) he did not dream that That Chymist or any other Author whatsoever had lighted on that part of the Experiment, till a good while after he had made and examined That among many others concerning Salts, as may be easily guess'd by the peculiar uses and applications He made of it. And though He had met with so unlikely an Experiment in a Writer, who, whether he deserve it or no, has the ill fortune to be much accus'd of Insincerity, and some of whose more easie processes our Author (who yet is willing to spare his Name, and seems to think his works not useless) could not find to succeed, He should not have taken it upon his Authority, no more then he is wont to take other Processes, divers of which He yet in the general supposes may be true upon the relation of other Chymists; who by blemishing their Books by things untrue and justly suspicious are not to be relyed on, nor much thanked by wary men. But will probably appear lesse pertinent to adde any thing further on this subject, then to take notice, that when the Author had once consented to the Publication of the following Papers, He several times wish'd for an Opportunity to make the Experiments and Observations, He now presents to the Publick, more full and compleat, then they were when addres's'd to a private Friend. But the Contagion, that drove him from the Places, where his Accommodatiens for repeating Experiments were, oblig'd Him to apply Himself to other Studies and Employments.

And upon the same account, though he afterwards found many of his Notes upon other parts of the Essay of Saltpetre, and have lying by him divers Papers concerning Sensible Qualities and Sensation in general, and the Production of Second Qualities, together with a collection of Notes about Occult Qualities, and some other Subjects of kin to those of this Book; yet having, upon the freshly intimated Occasion, diverted his Thoughts to other Subjects, He will not engage himself to put together and communicate his Collections on these Subject by any Publick promise. Fur-

Furthermore, as the Author *has in the following Disquisitions aim'd not at the raising or abetting a Faction in Philosophy, but at the Discovery of the Truth; so he is not so sollicitous what every sort of Reader will think of his Attempts, (which tis easie to foresee are not like to be overwelcome to the Votaries of the* School Philosophy) *as to refuse a Compliance with the desires of his Friends, who have been long since very earnest with him not to spend that time in* Replies *to particular Persons, which might be more usefully imploy'd in pursuing further Discoveries of Nature by* Experiments. *If he meet with any cogent and material Objections against any of his chief Opinions, He is enough a Lover of Truth, to be dispos'd to think himself oblig'd by those that shall shew him his Mistakes, and to take occasion to reforme them. But if nothing* new *or* weighty *be urg'd, He considers, that he lives in an Age, wherein he has observ'd (even in his Own case) that Truth, if recommended by real Experiments, will in time make their own way, and wherein live store of Ingenious Men, who, for the main, approve the Opinions, and probably will not dislike the Arguments he has propos'd, and who being more at leisure then He to write Polemicall Books, will not silently suffer what they judge Truth to be triumph'd over, or oppress'd by those, who, imploying usually but Scholastical Arguments, may be confuted by Answers of the like nature. And therefore He doubts not, but that some Learned Favourers of the* Corpuscularian Philosophy (*of which he hath endeavour'd to make out those parts, wherein they almost all agree*) *will be both able and willing to defend those Discoveries by rational Disputations, that they have not Opportunity to increase by New Experiments.*

In the mean while I have no Temptation to doubt in the least, but that this curious and excellent Piece will be entertained and received by all that have any regard to the great concerns of Learning with that gust, delight, respect, and estimation which it so highly merits. The

AN EXAMEN OF The *ORIGINE* (and *DOCTRINE*) OF Substantial Formes,

As it is wont to be taught by the Peripateticks.

To be placed before pag. 71.

REBD

The Authors Proœmial Diſcourſe to the Reader.

AS tis the part of a Mineraliſt both to *diſcover* new Mines, and to *work* thoſe that are already diſcovered, by ſeparating and melting the Oares to reduce them into perfect metal; ſo I eſteem, that it becomes a Naturaliſt, not onely to *deviſe* Hypotheſes and Experiments, but to examine and *improve* thoſe that are already found out. Upon this conſideration (among other motives) I was invited to make the following Attempt, whoſe productions coming to be expoſ'd to other eyes then thoſe for which they were firſt written, 'twill be requiſite to give the publick ſome account of the Occaſion, the Scope, and ſome Circumſtances. And this I ſhall do the more fully, becauſe the reaſons I am to render of my way of writing in reference to the Peripatetick Philoſophy muſt contain Intimations, which perhaps will not be uſeleſſe to ſome ſorts of Readers, (eſpecially Gentlemen) and by being apply'd to moſt of thoſe other parts of my Writings that relate to the School Philoſophy, may do them good ſervice, and ſave both my Readers and me ſome trouble of Repetitions.

Having four or five years ago publiſh'd a little Phyſico-Chymical Tract about the differing parts and redintegration of Nitre, I found as well by other ſigns as by the early ſollicitations of the Stationer for a new Edition, that I had no cauſe to complain of the reception that had been given it: but I obſerved too, that the Diſcourſe, conſiſting chiefly of Reflexions that were occaſionally made upon the *Phænomena* of a ſingle Experiment, was more available to confirm thoſe in the Corpuſcularian Philoſophy, that had already ſomewhat inquir'd into it, then to acquaint thoſe with the principles and notions of it, who were utter ſtrangers to it; and as

* The following Preface being addreſs'd only to *Pyrophilus*.

to many readers was fitter to excite a curiosity for that Philosophy, then to give an Introduction thereunto. Upthis occasion it came into my mind, that about the time when I writ that Essay about Salt-petre, (which was divers years before twas published) I had also some thoughts of a History of Qualities, and that having in loose sheets set down divers Observations and Experiments proper for such a design, I had also drawn up a Discours, which was so contriv'd, that though some parts of it were written in such a manner, as that they may serve for Expository Notes upon some particular passages of the Essay; yet those parts with the rest might serve for a *general Preface* to the History of Qualities, in case I should ever have conveniency as well as inclination to make the prosecuting of it my business; and in the mean time might present that *Pyrophilus* to whom I writ some kind of introduction to the principles of the Mechanical Philosophy, by expounding to him, as far as my thoughts and Experiments would enable me to do, in few words, what according to the Corpuscularian notions may be thought of the nature and Origine of Qualities and Forms; the knowledg of which either makes or supposes the most fundamental and useful part of Natural Philosophy. And to invite me to make use of these considerations and tryals about Qualities and Forms, it opportunely happen'd, that though I could not find many of the Notes written about particular Qualities, (my loose papers having been, during the late confusions, much scatter'd by the many removes I had then occasion to make) yet when last winter, being urged to publish my history of Cold, (which soon after came forth) I rumag'd among my loose Papers, I found, that the several Notes of mine that he had met with under various heads, but yet all concerning the Origine of Forms and Qualities together with the Preface addres'd to *Pyrophilus*, (though written at distant times and places) had

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two or three years before, by the care of an industrious person with whom I left them, been fairly copied out together, (which circumstance I mention, that the Reader may not wonder to find the following Book not written uniformly in one continued tenor) excepting some Experiments, which having been of my own making, twas not difficult for me to perfect, either out of my Notes and memory, or (where I doubted their sufficiency) by repeated Tryals. So that if the urgency wherewith divers ingenious men press'd the publication of my new Experiments about Cold, and my unwillingness to protract it, till the frosty season, that was fittest to examine and prove them, were all past, had not prevail'd with me to let those Observations be made publick the last Winter, they might have been accompanied with the present Essay of the *Origine of Qualities and Forms*, which may be premis'd to what I have written touching any of the particular Qualities, since it contains Experiments and Considerations fit to be preliminary to them all.

But though I was by this means diverted from putting out the following Treatise at the same time with the History of Cold, yet I was without much difficulty prevail'd with not to alter my intentions of suffering it to come abroad; beeause divers of my Historical accounts of some particular Qualities are to be reprinted, which may receive much light and confirmation by the things deliver'd in this present Treatise about Qualities and Forms in general. To which inducement was added the perswasion of some ingenious persons, who are pleas'd to confesse their having receiv'd more information and satisfaction in these Papers then I durst pretend to give them: though indeed the Subject is so noble and important, and does so much want the being illustrated by some distinct and experimental Discours, that *not onely* if I did not suspect my Friends of partiality, I should hope that it may gratify many Readers, and instruct more

then a few: but such as it is I do not altogether despair that it will prove neither unacceptable nor useless. And indeed the doctrines of Forms and Qualities, and Generation, and Corruption, and Alteration are wont to be treated of by Scholastical Philosophers in so obscure, so perplex'd, and so unsatisfactory a way, and their discourses upon these subjects do consist so much more of Logical and Metaphysical notions & niceties then of Physical Observations and reasonings, that it is very difficult for any Reader of but an ordinary capacity to understand what they mean, and no lesse difficult for any intelligent and unprejudic'd Reader to acquiesce in what they teach: which is oftentimes so precarious and so contradictious to its self, that most Readers, (without alwaies excepting such as are learned and ingenious) frighted by the darknesse and difficulties wherewith these subjects have been surrounded, do not so much as look after or read over these general and controverted matters, about which the Schools make so much noise; but despairing to find any satisfaction in the study of them, betake themselves immediately to that part of Physicks that treats of particular Bodies: so that to these it will not be unacceptable to have any intelligible notions offer'd them of those things, which as they are wont to be propos'd, are not wont to be understood: though yet the subjects themselves, if I mistake not, may be justly reckon'd not onely amongst the noblest and most important but (in case they be duely propos'd) among the usefullest and most delightful speculations that belong to Physicks.

I consider too, that among those that are inclin'd to that Philosophy, which I find I have been much imitated in calling *Corpuscularian*, there are many ingenious persons, especially among the Nobility and Gentry, who having been first drawn to like this new way of Philosophy by the sight of some Experiments, which for their novelty

novelty or prettineſſe they were much pleaſ'd with, or for their ſtrangeneſſe they admir'd, have afterwards delighted themſelves to make or ſee variety of Experiments, without having ever had the opportunity to be inſtructed in the rudiments or fundamental notions of that Philoſophy, whoſe pleaſing or amazing productions have enamour'd them of it. And as our *Pyrophilus*, for whom theſe Notes were drawn up, did in ſome regards belong to this ſort of *Virtuoſi*, ſo tis not impoſſible but that ſuch Readers as he was then, will not be ſorry to meet with a Treatiſe, wherein though my chief and proper buſineſſe be the giving ſome account of the nature and origine of Forms and Qualities; yet by reaſon of the connexion and dependance betwixt theſe and divers of the other principal things that belong to the general part of Phyſicks, I have been oblig'd to touch upon ſo many other important points, that this Tract may in ſome ſort exhibit a Scheme of, or ſerve for an Introduction into the Elements of the Corpuſcularian Philoſophy.

And as thoſe Readers that have had the curioſity to peruſe what is commonly taught in the Schools about Forms, and Generation, and Corruption, and thoſe other things we have been mentioning, and have (as is uſual among ingenious Readers) quitted the ſtudy of thoſe unſatisfactory intricacies with diſguſt, will not be diſpleaſ'd to find in our Notes ſuch Explications of thoſe things as render them at leaſt intelligible: ſo it will not perhaps prove unacceptable to ſuch Readers, to find thoſe matters which the Schools had interwoven with *Ariſtotle*'s Doctrine, reconcil'd and accommodated to the notions of the Corpuſcular Phyſicks.

If it be ſaid, that I have left divers things unmention'd which are wont to be largely treated of by the *Ariſtotelians*, and particularly have omitted the diſcuſſion of ſeveral Queſtions, about which they are wont very

ſolemnly and eagerly to contend, I readily acknowledge it to be true: but I anſwer further, that to do otherwiſe then I have done, were not agreeable to the nature of my deſign, as is declar'd in the preface to *Pyrophilus*; and that though moſt Readers will not take notice of it, yet ſuch as are converſant in that ſort of Authors will, I preſume, eaſily find, that I have not left them unconſulted, but have had the curioſity to reſort to ſeveral both of the more and of the leſſe recent Scholaſtical writers about Phyſicks, and to ſome of the beſt Metaphyſicians to boot, that I might the better inform my ſelf, both what their opinions are, and upon what arguments they are grounded. But as I found thoſe inquiries far more troubleſome then uſeful, ſo I doubt not that my omiſſions will not much diſpleaſe that ſort of Readers, for whoſe ſake chiefly tis that theſe papers are permitted to be made publick. For if I ſhould increaſe the obſcurity of the things themſelves I treat of, by adding the ſeveral obſcurer Comments (rather then Explications) and the perplex'd and contradictious opinions I have met with among Scholaſtick writers, I doubt that ſuch perſons as I chiefly write for, would inſtead of better comprehending what I ſhould *ſo* deliver, abſolutely forbear to read it. And there being many Doctrines, to which number this we are ſpeaking of ſeems to belong, wherein the ſame innate light or other arguments that diſcover the truth do likewiſe ſufficiently ſhew the erroneouſneſs of diſſenting opinions. I hope it may ſuffice to propoſe and eſtabliſh the notions that are to be imbrac'd, without ſollicitouſly diſproving what cannot be true, if thoſe be ſo. And indeed there are many opinions and arguments of good repute in the Schools, which do ſo entirely rely upon the authority of *Ariſtotle* or ſome of his more celebrated followers, that where that Authority is not acknowledg'd, to fall upon a ſolemn confutation of what has been ſo precariouſly advanc'd

vanc'd, were not onely unneceſſary but indiſcreet even in a Diſcourſe not confin'd to the brevity challeng'd by the nature of this of Ours. And there are very many Queſtions and Controverſies, which though hotly and clamorouſly contended about, and indeed pertinent and fit enough to be debated in their Philoſophy, do yet ſo much ſuppoſe the truth of ſeveral of their Tenents, which the new Philoſophers reject, *or* are grounded upon Technical Terms or forms of ſpeaking, that ſuppoſe the truth of ſuch opinions, *or* are expreſſions, whereof we neither do nor need make any uſe: that to have inſerted ſuch debates into ſuch a Diſcourſe as mine, would have been not onely tedious but impertinent. As (for inſtance) thoſe grand diſputes, whether the four Elements are endow'd with diſtinct ſubſtantial Forms, or have onely their proper qualities in ſtead of them? and whether they remain in mix'd bodies according to their Forms or according to their Qualities? and whether the former or the latter of thoſe be or be not refracted? Theſe, I ſay, and divers other controverſies about the four Elements and their manner of miſtion are quite out of doors in their Philoſophy, that acknowledg neither that there are four Elements, nor that Cold, Heat, Dryneſſe, and Moiſture are, in the Peripatetick ſenſe, firſt Qualities, or that there are any ſuch things as ſubſtantial Forms *in rerum naturâ*. And it made me the more unwilling to ſtuff theſe Papers with any needleſſe School-controverſies, becauſe I found upon peruſal of ſeveral Scholaſtick writers, (eſpecially the recenter, who may probably be ſuppoſ'd to be the moſt refin'd) that they do not alwaies mean the ſame things by the ſame terms, but ſome imploy them in one ſenſe, others in another, and ſometimes the ſame Writer uſes them in very differing ſenſes; which I am oblig'd to take notice of, that ſuch Readers as have conſulted ſome of thoſe Authors may not accuſe me of miſtaking or injuring ſome of the

Scholaſtical Terms and notions he may meet with in theſe papers, when I have onely imploy'd them in the ſenſe of other School-writers which I judg'd preferrible. And this puts me in mind of intimating, that whereas on the contrary, I ſometimes imploy'd variety of Terms and phraſes to expreſſe the ſame thing, I did it purpoſely, though perhaps to the prejudice of my own reputation, for the advantage of *Pyrophilus*; both I and others having obſerved, that the ſame unobvious notions being ſeveral wayes expreſs'd, ſome Readers even among the ingenioſer ſort of them will take it up much better in one of thoſe Expreſſions, and ſome in another.

But perhaps it will be wondred at even by ſome of the new Philoſophers, that diſſenting ſo much as I do from *Ariſtotle* and the Schoolmen, I ſhould overlook or decline ſome arguments, which ſome very ingenious men think to be of very great force againſt the doctrine I oppoſe. But divers of theſe arguments being ſuch as the Logicians call *ad hominem*, I thought I might well enough ſpare them. For I have obſerv'd *Ariſtotle* in his Phyſicks to write very often in ſo dark and ambiguous a way, that tis far more difficult then one would think to be ſure what his opinion was: and the unlearned and too frequently jarring gloſſes of his interpreters have often made the Comment darker then the Text: ſo that (though in moſt it be, yet) in divers caſes tis not eaſie (eſpecially without the expence of many words) to lay open the contradictions of the Peripatetick doctrine; beſides that the urging ſuch contradictions are oftentimes fitter to ſilence an unwary Adverſary, then ſatisfie a wary and judicious Reader. It being very poſſible, that a man may contradict himſelf in two ſeveral places of his works, and yet not be in both of them in the wrong. For one of his aſſertions, though inconſiſtent with the other, may yet be conſiſtent with truth. But this is not all I have to ſay on this occaſion. For beſides that having

ving for many reaſons elſewhere mention'd purpoſely forborn the reading of ſome very much and for ought I know very juſtly eſteem'd diſcourſes about general *Hypotheſes*, tis very poſſible that *I* may be a ſtranger to ſome of thoſe arguments: beſides this, I ſay, I confeſſe I have purpoſely forborn to make uſe of others, which I have ſufficiently taken notice of. For ſome of thoſe Ratiocinations would engage him that ſhould imploy them, to adopt an *Hypotheſis* or Theory, in which perhaps I am not ſo throughly ſatisfied, and of which I do not conceive my ſelf to have on this occaſion, any neceſſity to make uſe: and accordingly I have forborn to imploy Arguments, that are either grounded on, *or* ſuppoſe Indiviſible Corpuſcles call'd *Atoms*, or any *innate motion* belonging to them; *or* that the Eſſence of Bodies conſiſts in Extenſion, *or* that a Vacuum is impoſſible; *or* that there are ſuch *Globuli cæleſtes*, *or* ſuch a *Materia ſubtilis*, as the Carteſians imploy to explicate moſt of the *Phænomena* of Nature. For theſe and divers other Notions, I (who here write rather for the Corpuſcularians in general, then any party of them) thought it improper needleſly to take in, diſcourſing, *either* againſt thoſe to whom theſe things appear as diſputable, as the Peripatetick Tenents ſeem to me; *or* for to ſatisfie an ingenious perſon, whom it were not fair to impoſe upon with *Notions*, that I did not my ſelf think proper.

And on the like Account I forbore ſuch *Arguments* as thoſe that ſuppoſe in Nature and Bodies inanimate, Deſignes and Paſſions proper to Living, and perhaps peculiar to Intelligent, Beings; and (ſuch as) ſome Proofs that are drawn from the Theology of the Schools: (which I wiſh leſſe interwoven with *Ariſtotle's* Philoſophy.) For though there be ſome things, which ſeem to be of this ſort, (as Arguments drawn from final cauſes in divers particulars that concern Animals,) which in a ſound ſenſe, I not onely admit but maintain: yet ſince, as they

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are wont to be propos'd, they are liable enough to be question'd, I thought it expedient for my present design to pretermit them, as things that I do not absolutely need; though the imploying some of them would facilitate my Task. And this I did the rather, because I also forbear to answer Arguments, that however vehemently and subtly urg'd by many of the modern Schoolmen of the Roman Catholick Communion, are either confessedly, or at least really built upon some Theologicall Tenents of theirs, which being oppos'd by the Divines of other Churches, and not lest unquestion'd by some Acute ones of their own, would not be proper to be solemnly taken notice of by Me, whose businesse in this Tract is to discourse of Natural things as a Naturalist, without invading the Province of Divines, by intermedling with Supernatural Mysteries, such as those, upon which divers of the Physico-Theologicall Tenents of the Schoolmen, especially about real Qualities, and *the Separableness of Accidents from Subjects of Inhesion, are *manifestly*, if not also *avowedly* grounded. But to return to the other things I was owning to have left unmention'd; notwithstanding all that I have been saying, I readily acknowledge, that in some recent Authors, that have been imbracers of the new Philosophy, I have met with some passages, that might well and pertinently be taken into the following Discourse, but That having been (as I formerly intimated) transcrib'd some years ago, I cannot now so convenient-

* *Atque hæc sententia* (of the Distinction and Separableness of Quantity from Matter) *est omnino tenenda: quanquam enim non possit ratione naturali sufficienter demonstrari, tamen ex principiis Theologiæ convincitur esse vera, maximè propter mysterium Eucharistiæ*: Suarez disp. Metaph. 40. p. m. 341. paucisque interjectis,—*prima ratio pro hac sententia est, quia in mysterio Eucharistiæ Deus separavit quantitatem à substantiis panis & vini*, &c. & p. m. 342. —*Hæc responsio & sententia* [Adversariorum] *sic explicata non potest facilè & evidenter impugnari, si stendo in puro naturali; nihilominus tamen, partim ratione naturali, partim adjuncto mysterio sufficientissimè improbatur.*

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ly Alter it: which I am the leſſe troubled at, becauſe theſe few additional Arguments, thought fit to illuſtrate or confirme, being not neceſſary to make out what has been deliver'd, may ſafely be let alone, unleſſe there happen (as 'tis not unlikely there may) an occaſion of reprinting theſe Notes, with ſuch Enlargements as may make them the more fit to be an Introduction into the Corpuſcular Philoſophy.

I hope then upon the whole matter, that I have pitch'd upon that way that was the moſt conducive to my Deſign, *partly* by inſiſting onely on thoſe Opinions, whether true or falſe, which for their Importance or Difficulty ſeem'd to deſerve to be particularly either explicated or diſprov'd; and *partly*, by chooſing to imploy ſuch Arguments as I thought the cleareſt, and cogenteſt, and by their aſſuming the leaſt of any, ſeem'd the eaſieſt to be vindicated from Exceptions: without troubling my ſelf to anſwer Objections, that appear'd rather to be drawn from Metaphyſical or Logical Subtilties, or to be grounded upon the Authority of men, then to be Phyſical Ratiocinations, founded upon Experience, or the nature of the things under debate, eſpecially having in the propoſal and confirmation of the Truth, ſo laid the grounds, and intimated the wayes of anſwering what is like to be colourably objected againſt it, that an ingenious man may well enough furniſh himſelf with Weapons to defend the Truth, out of the Notions, Hints, and Experiments, wherewith in this Tract care has been taken to accompany it. And my forbearing to proſecute ſome of the Peripatetick Controverſies any further then I have done, will not, I hope, be blam'd by them, that have obſerv'd as well as I, how much thoſe Diſputes are wont to be lengthned by ſuch frivolous Diſtinctions, as do not deſerve to be ſolemnly examin'd, eſpecially in ſuch a compendious Treatiſe as Ours. For an attentive Reader needs not be much converſant with the writings of the modern Peripate-

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ticks, about such subjects as Substantial Forms, Generation, Corruption, *&c.* to take notice, that 'tis their Custome, when they find themselves distress'd by a solid Argument, to endeavour to elude it by some pittifull Distinction or other, which is usually so groundless, and so unintelligible, or so nugatory, or so impertinent to the Subject, or at least so insufficient for the purpose 'tis alledg'd for, that to vouchsafe it a sollicitous Confutation might question a Writers Judgment with intelligent Readers; who by such insignificant Distinctions are satisfy'd of nothing so much as that the Framers of them had rather say (that which indeed amounts to) nothing, then not seem to say something. And of such Evasions they may probably be emboldned to make use, by the practice of *Aristotle* himself, to whom such obscure and unsatisfactory Distinctions are so familiar, that I remember one of his own Commentators * (and he one of the most judicious) could not forbear, upon a certain Text of his Masters to complain of it, and particularly to take notice, that That one Distinction of *actu & potentia* runs through almost all *Aristotles* Philosophy, and is imploy'd to shift off those difficulties he could not clearly Explicate.

By which nevertheless I would not be understood to censure or decry the whole Peripatetick Philosophy, much lesse to despise *Aristotle* himself; whose own Writings give me sometimes cause a little to wonder, to find some Absurdities so confidently father'd upon him by his Scholastick Interpreters. For I look upon *Aristotle* as

* The Author here meant is the Inquisitive Peripatetick *Cabæus*, who in one place hath these words. *ut hanc quæstionem solvat, recurrit ad illam distinctionem sibi valde familiarem; quâ utitur Aristoteles in tota sua Philosophia, quoties obviam habet aliquam gravem difficultatem, distinguit enim actu vel potentia;* &c. In another these: —*Quæ est distinctio quædam familiaris Aristoteli, quam applicat omnibus rebus, ubi difficultates urgent, & videtur istis vocibus quasi fatali gladio omnes rescindere difficultatis nodos; vix enim est difficultas, cui non putat se satisfacere distinguendo* actu & potentiâ.

one

one (though but as *one amongst many*) of those fam'd Antients, whose Learning about *Alexanders* time ennobled *Greece*, and I readily allow him most of the praises due to great Wits, excepting those which belong to clear-headed Naturalists. And I here declare once for all, that where in the following Tract, or any other of my writings, I do *indefinitely* depretiate *Aristotle's* Doctrine, I would be understood to speak of *his Physicks*, or rather of the Speculative part of them, (for his Historical Writings concerning Animals I much esteem) nor do I say, that even these may not have their use among Scholars, and even in Universities, if they be retain'd and studied with due cautions and Limitations; (of which I have elsewhere spoken.)

But to resume the Discourse, whence the Peripatetick Distinctions tempted me to digresse; by any thing I formerly said, I would not in the least disparage those excellent, and especially those modern Authors, that have professedly opposed the *Aristotelian* Physicks: (such as *Lucretius*, *Verulam*, *Basso*, *Des Cartes* and his Followers, *Gassendus*, the two *Boots*, *Magnenus*, *Pemble*, *Helmont*,) nor be thought to have made no use of any of their Cogitations or Arguments. For though some of their Books I could not procure, when I had occasion to have recourse to them; and though the weakness of my Eyes discourag'd me from perusing those parts of others, that concern'd not the Subject I was treating of, yet I hope I have been benefitted by those I have consulted, and might have been more so, by the Learned *Gassendus's* Little, but Ingenious, *Syntagma Philosophiæ Epicuri*, if I had more seasonably been acquainted with it.

But *whether* we have treated of the Nature and Origine of Forms and Qualities in a more comprehensive way then others, *whether* we have by new and fit Similitudes and Examples, and other means rendred it more intelligible then they have done, *whether* we have added

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any considerable number of Notions and Arguments, towards the compleating and confirming of the propos'd *Hypothesis*, *whether* we have with reason dismiss'd Arguments unfit to be rely'd on, and *whether* we have propos'd some Notions and Arguments so warily, as to keep them from being lyable to Exceptions or Evasions, whereto they were obnoxious as others have propos'd them, *whether* (I say) we have done all or any of these in the first or Speculative part of this Treatise, we willingly leave the Reader to judge: But in the second or Historical part of it, perhaps he will be invited to grant, that we have done that part of Physicks we have been treating of some little service: since by the Lovers of real Learning, it was very much wish'd, that the Doctrines of the new Philosophy (as 'tis call'd) were back'd by particular Experiments; the want of which I have endeavour'd to supply, by annexing some, whose Nature and Novelty I am made believe will render them as well Acceptable as Instructive. For though, that I might not anticipate what belongs to other papers, I did not make the Last *Section* consist of above a Decad of them, and though, for the reasons intimated in the Advertisements premis'd to them, I did not expresly mention to *Pyrophilus* all that I could have told him about them; yet I have been carefull so to choose them, and to interweave hints in delivering them, that a sagacious Reader, who shall have the Curiosity to try them heedfully, and make Reflexions on the several *Phenomena*, that in likelihood will occurre to him, will (if I mistake not) receive no contemptible information, as of some other things, so particularly about the nature of Mixtions, (which I take to be one of the most important and useful, though neglected and ill understood, Doctrines of the Practical part of Physicks) and may probably light upon more then he Expects, or I have fully Delivered, and perhaps too more then I Foresaw.

And though some *Virtuosi*, more conversant perhaps with

with Things then Books, presuming the Decay of the Peripatetick Philosophy to be every where as great, as 'tis among them in *England*, may think that a Doctrine, which they look on as Expiring, need not have been so sollicitously confuted: yet those that know how deep rooting this Philosophy has taken (both elsewhere, and particularly) in those Academies, where it has flourish'd for many Ages, and in some of which 'tis, exclusively to the Mechanical Philosophy, water'd and fenced by their Statutes or their Superiours: and he that also knows, how much more easie some (more subtle, then Candid) Wits find it plausibly to defend an Error, then ingeniously to confesse it; will not wonder, that I should think, that a Doctrine so advantag'd, though it be too erroneous to be Fear'd, is yet too considerable to be Despis'd. And not to question, whether several of those, that most contemn the favourers of the Peripatetick *Hypotheſis*, as the later Discoveries have reduc'd them to Reform it, be not the least provided to answer their Arguments: (not to question this, I say,) there are divers of our Adversaries (misled onely by Education, and morally harmlesse prejudices) who do so much Deserve a better cause, then that which Needs all their subtilty without being Worthy of it, that I shall think more paines, then I have taken, very usefully bestow'd, if my Arguments and Experiments prove so happy, as to undeceive Persons, whose parts too unluckily confin'd to Narrow and Fruitlesse Notions, would render them illustrious Champions for the Truths they are able so Subtlely to oppose; and who might questionlesse performe Considerable things, if they imploy'd as much Dexterity to Expound the Mysteries of Nature, as the Riddles of the School-men; and laid out their Wit and Industry to surmount the Obscurity of Her works instead of that of *Aristotles*.

There might be a few other particulars fit to be taken

notice

notice of in this Preface, but finding that I had already mention'd them in that, which I had addreſſ'd to *Pyrophilus*, my haſte makes me willing rather to refer the Reader thither for them, then Alter that, or Lengthen this; (which I ſhould think much too Long already, if it were not poſſible that it may hereafter prove Prælimi-nary to more papers then theſe 'tis now premiſ'd to.) So that there remaines but one Advertiſement neceſſary to be given here, namely, that whereas in the following Notes I ſeveral times ſpeak of the Author of the Eſſay of Salt-petre, as of a third perſon, the Occaſion of that was, that when theſe Notes and ſome about particular Qualities were written, I had a Deſign to make two diſtinct ſorts of Annotations upon that Eſſay; in the *former* whereof (which now comes forth) I aſſumed the perſon of a Corpuſcularian, and diſcourſ'd at that rate: But I had thoughts too (in caſe God were pleaſ'd to grant me Life and Opportunity) to take a *ſecond* Review both of the Treatiſe it ſelf, and of the Notes on it, and on that occaſion to adde what my riper Thoughts and further Experience might ſuggeſt unto me. And that in my Animadverſions I might with the more freedome and Conveniency Adde, Explain, Alter, and even Retract, as I ſhould ſee cauſe, I thought it not amiſſe to write them, as if they were made on the Work of another. By which Intimation the Reader may be aſſiſted to gueſſe how much I intended in the following Diſcourſe (in which, as in the Prefaces belonging to it, I play the Corpuſcularian) to reſerve my ſelf the Freedome of Queſtioning and Correcting upon the deſign'd Review any thing deliver'd in theſe Notes; and how much more it was in them my deſign to bring *Pyrophilus* Experiments and Queries to illuſtrate obſcure matters, then by haſty Aſſertions to Dogmatize about them.

THE

The Preface.

THE *Origine* (Pyrophilus) *and Nature of the Qualities of Bodies is a Subject, that I have long lookt upon as one of the moſt Important and Uſeful that the Naturaliſt can pitch upon for his Contemplation. For the Knowledge we have of the Bodies without Us, being for the moſt part fetched from the Informations the Mind receives by the Senſes, we ſcarce know any thing elſe in Bodies, upon whoſe account they can work upon our Senſes, ſave their Qualities: For as to the Subſtantial Formes, which ſome Imagine to be in all Natural Bodies, it is not halfe ſo Evident, that there are ſuch, as it is, that the wiſeſt of thoſe that do admit them, Confeſſe, that they do not well Know them.* And as tis by their Qualities, that Bodies act Immediately upon our Senſes, ſo 'tis by vertue of thoſe Attributes likewiſe, that they act upon Other Bodies, and by that action produce in Them, and oftentimes in Themſelves, thoſe Changes, that ſometimes we call Alterations, and ſometimes Generation or Corruption.*

*Nego tibi ullam eſſe formam nobis notam plenè & planè; noſtrâmq; ſcientiam eſſe umbram in Sole. Scaliger. (*Of whoſe confeſſion to the ſame purpoſe more are cited hereafter.*)

And 'tis chiefly by the Knowledge, such as it is, that Experience (not Art) hath taught Us, of these differing Qualities of Bodies, that we are enabled, by a due application of Agents to Patients, to exercise the little Empire, that we have either Acquir'd or Regain'd over the Creatures. But I think not the contemplation of Qualities more Noble and Useful, then I find it Difficult; For what is wont to be taught us of Qualities in the Schools, is so Slight and ill grounded, that it may be doubted, whether they have not rather Obscured, then Illustrated the things they should have explain'd. And I was quickly discouraged from expecting to learn much from them of the Nature of diverse Particular Qualities, when I found, that except some few, which they tell You in General may be deduced (by wayes they leave those to gueße at that can,) from those four Qualities, they are pleas'd to call the First; they confeße, that the rest spring from those Forms of Bodies, whose particular Natures, the judiciouseſt of them acknowledge they cannot comprehend. And Aristotle *himself not onely doth (as we shall see anon) give us of Quality in General, (which yet seems far more easily defineable, then many a Particular Quality,) no other then such a definition, as is as Obscure, as the thing to be declared by it; but I observe, not without some wonder, that in his eight Books of* Physicks, *where he professedly treats of the General Affections of Natural things, he leaves*

out

out the Doctrine of Qualities; as after him Magirus, and diverse other Writers of the Peripatetick Physiologie have done: which (by the way) I cannot but look upon as an Omission, since Qualities do as well seem to belong to Natural Bodies generally consider'd, as Place, Time, Motion, and those other things, which upon that account are wont to be Treated of in the General part of Natural Philosophy. The most Ingenious Des Cartes has something concerning some Qualities; but though, for reasons elsewhere express'd, I have purposely forborn to peruse his Systeme of Philosophy, yet I find by Turning over the Leaves, that he has left most of the other Qualities Untreated of, and of those that are more properly call'd Sensible, he speaks but very Briefly and Generally; rather considering what they do upon the Organs of Sense, then what Changes happen in the Objects themselves, to make them Cause in us a Perception sometimes of one Quality, and sometimes of Another. Besides, that his Explications do many of them so depend upon His peculiar Notions (of a Materia Subtilis, Globuli Secundi Elementi, and the like) and These, as it became so Great a Person, he has so Interwoven with the rest of his Hypothesis, that They can seldome be made Use of, without Adopting his whole Philosophy. Epicurus indeed, and his Scholiast Lucretius, have given some good Hints concerning the Nature of some few Qualities. But beside that even these Explica-

cations are diverſe of them either Doubtful or Imperfect, or both, there are many other Qualities, which are left for Others to Treat of. And this is the Second and maine Difficulty, which I find in inveſtigating the Nature of Qualities, namely, that Whatever be to be thought of the General Theories of Ariſtotle *or other Philoſophers concerning Qualities, we evidently want That, upon which a Theory, to be Solid and Uſeful, muſt be Built; I mean an Experimental Hiſtory of them. And this we ſo want, that except perhaps what Mathematicians have done concerning Sounds, and the Obſervations (rather then Experiments) that our Illuſtrious* Verulam *hath (in ſome few Pages) ſay'd of Heat, in his ſhort* Eſſay, De Formâ Calidi; *I know not Any one Quality, of which any Author has yet given us an any thing competent Hiſtory. Theſe things I mention to You,* Pyrophilus, *not at all to derogate from thoſe Great Men, whoſe deſign ſeems rather to have been to deliver Principles and Summaries of Philoſophy, then to inſiſt upon Particulars; but for this purpoſe, that ſince the Nature of Qualities is ſo* beneficial *a ſpeculation, my labours may not be look'd upon as wholly Uſeleſs, though I can contribute but a little to the clearing of it: and that ſince 'tis ſo* abſtruſe *a ſubject, I may be pardon'd, if I ſometimes miſſe the Mark, and leave divers things uncompleated; That being but what ſuch great Philoſophers have done before me.*

But,

But, Pyrophilus, *before I proceed to give You my Notes upon this part of our Author's Eſſay, that you may rightly underſtand my Intention in them, it will be requiſite to give you three or four Advertiſements.*

And firſt, when ever I ſhall ſpeak indefinitely of Subſtantial Forms, I would alwaies be underſtood to except the Reaſonable Soul, that is ſaid to informe the humane Body; which Declaration I here deſire may be taken notice of once for all.

Secondly, Nor am I willing to treat of the Origine of Qualities in Beaſts; partly becauſe I would not be engaged to examine, of what Nature their Soules are, and partly becauſe it is difficult in moſt caſes, (at leaſt for one, that is compaſſionate enough,) either to make Experiments upon Living animals, or to judge what influence their Life may have upon the change of Qualities, produc'd by ſuch Experiments.

Thirdly, *The occaſion of the following Reflections being onely this, that our Author, in that part of his Eſſay concerning Salt peter, whereto theſe Notes referre, does briefly Intimate ſome Notions about the Nature and Origine of Qualities; You muſt not exſpect, that I, whoſe Method leads me but to Write ſome Notes upon this and ſome other parts of this* Eſſay, *ſhould make Solemne or Elaborate diſcourſes concerning the Nature of particular Qualities, and that I ſhould fully deliver*

my own apprehenſions concerning thoſe Subjects. For as I elſewhere ſufficiently intimate, that in theſe firſt Notes I Write as a Corpuſcularian, *and ſet down thoſe Things onely, that ſeem to have a tendency to Illuſtrate or Countenance the Notions or Fancies imply'd in our Author's* Eſſay: *So I muſt here tell you, that I neither have now the Leaſure, nor Pretend to the Skill to deliver Fully the Hiſtory, or to Explicate Particularly the Nature of each ſeveral Quality.*

Fourthly, *But I conſider, that the Schools have of late much Amuſ'd the World, with a way they have got of Referring all Natural Effects to certain Entities, that they call* Real Qualities, *and accordingly attribute to them a Nature diſtinct from the Modification of the Matter they belong to, and in ſome caſes Separable from all Matter whatſoever, by which Meanes they have, as far forth as their Doctrine is acquieſc'd in, made it thought Needleſs or Hopeleſs for men to Employ their Induſtry, in ſearching into the Nature of Particular Qualities, and their Effects. As if, (for Inſtance) it be Demanded, how Snow comes to dazle the Eyes, they will anſwer, that 'tis by a* Quality *of Whiteneſſe that is in It; which makes all very white Bodies produce the ſame Effect; And if You ask what this Whiteneſſe is, They will tell you no more in ſubſtance, then that 'tis a* real Entity, *which denominates the Parcel of Matter, to which it is joyn'd, White; and if You further*

Enquire

Enquire, what this real Entity, which they call a Quality, is, You will find, as We ſhall ſee anon, that They either ſpeak of it much after the ſame rate that they do of their Subſtantial Forms, (as indeed ſome of the Modern'ſt teach, That a Quality affects the Matter it belongs to per modum formæ ſecundariæ, *as they ſpeak) or at leaſt they will not Explicate it more Intelligibly.*

And accordingly if you further ask them, how white Bodies in General do rather produce this effect of dazling the Eyes, then Green or Blew ones, inſtead of being told, that the former ſort of Bodies reflect Outwards, and ſo to the Eye, far more of the Incident Light, then the Latter; You ſhall perchance be told, that 'tis their reſpective Natures ſo to act, by which way of diſpatching difficulties, they make it very eaſie *to ſolve all the Phenomena of Nature in General, but make men think it* impoſſible *to explicate almoſt Any of them in Particular.*

And though the Unſatisfactorineſſe and Barrenneſſe of the School-Philoſophy have perſwaded a great many Learned Men, eſpecially Phyſicians, to ſubſtitute the Chymiſts Three principles, inſtead of thoſe of the Schools, and though I have a very good opinion of Chymiſtry it ſelf, as tis a Practical Art; yet as 'tis by Chymiſts pretended to containe a Syſteme of Theorical Principles of Philoſophy, I fear it will afford but a very little ſatisfaction to a ſevere enquirer into the Nature of Qualities. For be-

ſides that, as we ſhall more particularly ſee anon, there are Many Qualities, which cannot with any probability be deduc'd from Any of the three Principles; thoſe that are aſcrib'd to One, or other of them, cannot Intelligibly be explicated, without recourſe to the more Comprehenſive Principles of the Corpuſcularian Philoſophy, to tell us, for inſtance, that all Solidity proceeds from Salt, onely informing us, (where it can plauſibly be pretended) in what *material principle or* ingredient *that Quality* reſides, *not* how *it is* produced; *for this doth not teach us, (for example)* how *Water even in exactly cloſ'd veſſels comes to be frozen into Ice; that is, turn'd from a fluid to a Solid Body, without the acceſſion of a ſaline ingredient (which I have not yet found pretended, eſpecially Glaſſe being held impervious to Salts. Wherefore,* Pyrophilus, *I thought it might much conduce to the underſtanding the Nature of Qualities, To ſhew how they are Generated; and by the ſame way, I hop'd it might remove in ſome meaſure the obſtacle, that theſe Dark and Narrow Theories of the Peripateticks and Chymiſts may prove to the Advancement of ſolid and uſeful Philoſophy. That then, which I chiefly aime at is to make it Probable to you by Experiments, (which I think hath not yet been done:) That almoſt all ſorts of Qualities, moſt of which have been by the Schooles either left Unexplicated, or Generally*

nerally referr'd to I know not what Incomprehensible Substantial Formes may be produced Mechanically, I mean by such Corporeal Agents, as do not appear either to Work otherwise, then by vertue of the Motion, Size, Figure, and Contrivance of their own Parts, (which Attributes I call the Mechanical Affections of Matter, because to Them men willingly Referre the various Operations of Mechanical Engines:) or to Produce the new Qualities exhibited by those Bodies, their Action changes, by any other way, then by changing the Texture, or Motion, or some other Mechanical Affection of the Body wrought upon. And this if I can in any passable measure do, though but in a general way, in some or other of each of these Three Sorts, into which the Peripateticks are wont to Divide the Qualities of Bodies, I hope I shall have done no useless piece of Service to Natural Philosophy, Partly by exciting You, and Your Learned Friends, to Enquire after more Intelligible and Satisfactory wayes of explicating Qualities, and partly by beginning such a Collection of Materials towards the History of those Qualities, that I shall the most largely insist on, as Heat, Colours, Fluidity and Firmnesse, as may invite You and other Ingenious Men to contribute also their Experiments & Observations to so Useful a Work, and thereby lay a foundation, whereon You, and perhaps I, may superstruct a more Distinct & Explicite

plicite Theory of Qualities, then I ſhall at preſent adventure at. And though I know, that ſome of the things my Experiments tend to Manifeſt may likewiſe be Confirm'd by the more obvious Phenomena of Nature, yet I preſume You will not diſlike my Choſing to entertain You with the Former, (though without at all Deſpiſing, or ſo much as ſtrictly forbearing to Employ the Latter,) becauſe the Changes of Qualities made by Our Experiments will for the moſt part be more Quick and Conſpicuous, and the Agents made uſe of to produce them being of our own Applying, and oftentimes of our own Preparation, we may be thereby aſſiſted the better to judge of what they Are, and to make an eſtimate of what tis they Do-

CONSIDERATIONS *AND* EXPERIMENTS,

touching

The Origine of Qualities and Forms.

The Theorical Part.

THat before I deſcend to Particulars, I may (*Pyrophilus*) furniſh you with ſome General Apprehenſion of the Doctrine (or rather the *Hypotheſis*) which is to be Collated *with*, and to be either Confirmed or Diſproved by the Hiſtorical Truths, that will be deliver'd concerning Particular Qualities, (and Forms;) I will aſſume the perſon of a Corpuſcularian, and here, at the Entrance, give you (in a general way) a brief Account of the *Hypotheſis* it ſelfe, as it concernes the Origine of Qualities (and Forms:) and for Diſtinction's ſake, I ſhall comprize it in the Eight following Particulars, which, that the whole Scheme may be the better Comprehended, and as it were Survey'd under one Proſpect

Prospect, I shall do little more then barely propose *Them*, that either seem evident enough by their own Light, or may without prejudice have divers of their Proofs reserv'd for proper places in the following part of this Treatise: and though there be some *Other* Particulars, to which the Importance of the Subjects, and the Greatnesse of the (almost Universal) Prejudices, that lye against them, will oblige me immediately to annexe (for the seasonable Clearing and Justifying of them) some Annotations: yet that they may as little as I can obscure the Coherence of the whole Discourse, as much of them as conveniently may be shall be included in [ ] Paratheses.

I. I agree with the generality of Philosophers so far, as to allow, that there is one Catholick or Universal Matter common to all Bodies, by which I mean a Substance extenned, divisible, and impenetrable.

II. But because this Matter being in its own Nature but one, the diversity we see in Bodies must necessarily arise from somewhat else, then the Matter they consist of. And since we see not, how there could be any change in Matter, if all its (actual or designable) parts were perpetually at rest among themselves, it will follow, that to discriminate the Catholick Matter into variety of Natural Bodies, it must have Motion in some or all its

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deſignable Parts: and that Motion muſt have various tendencies, that which is in this part of the Matter tending one way, and that which is in that part tending another; as we plainly ſee in the Univerſe or general Maſs of Matter there is really a great quantity of Motion, and that variouſly determin'd, and that yet diverſe portions of Matter are at reſt.

That there is Local Motion in many parts of Matter is manifeſt to ſenſe, but how Matter came by this Motion was of Old, and is ſtill hotly diſputed of: for the antient Corpuſcularian Philoſophers, (whoſe doctrine in moſt other points, though not in all, we are the moſt inclinable to,) not acknowledging an Author of the Univerſe, were thereby reduc'd to make Motion congenite to Matter, and conſequently coëval with it; but ſince Local Motion, or an Endeavour at it, is not included in the nature of Matter, which is as much Matter when it reſts, as when it moves; and ſince we ſee, that the ſame portion of Matter may from Motion be reduc'd to Reſt, and after it hath continu'd at Reſt, as long as other Bodies do not put it out of that ſtate, may by external Agents be ſet a moving again; I, who am not wont to think a man the worſe Naturaliſt for not being an Atheiſt, ſhall not ſcruple to ſay with an eminent Philoſopher of Old, whom I find to have propoſ'd among the

Greeks

Greeks that Opinion (for the main) that the Excellent *Des Cartes* has revived amongſt Us, That the Origine of Motion in Matter is from God ; and not onely ſo, but that thinking it very unfit to be believ'd, that Matter barely put into Motion , and then left to it ſelf, ſhould Caſually conſtitute this beautiful and orderly World: I think alſo further, that the wiſe Author of Things did, by eſtabliſhing the laws of Motion among Bodies, and by guiding the firſt Motions of the ſmall parts of Matter, bring them to convene after the manner requiſite to compoſe the World, and eſpecially did contrive thoſe curious and elaborate Engines, the bodies of living Creatures, endowing moſt of them with a power of propagating their Species. But though theſe things are my Perſwaſions, yet becauſe they are not neceſſary to be ſuppoſ'd here, where I do not pretend to deliver any compleat Diſcourſe of the Principles of Natural Philoſophy , but onely to touch upon ſuch Notions , as are requiſite to explicate the Origine of Qualities and Forms, I ſhall paſſe on to what remains , as ſoon as I have taken notice , that *Local Motion ſeems to be indeed the Principal amongſt Second Cauſes, and the Grand Agent of all that happens in Nature*: For though Bulk, Figure, Reſt, Situation, and Texture do concurre to the *Phænomena* of Nature, yet in compariſon of Motion

tion they ſeem to be, in many Caſes, Effects, and in many others, little better then *Conditions*, or *Requiſites*, or Cauſes *ſine quibus non*, which modifie the operation, that one part of Matter by vertue of its Motion hath upon another: as in a Watch, the number, the figure, and coaptation of the Wheels and other parts is requiſite to the ſhewing the hour, and doing the other things that may be perform'd by the Watch; but till theſe parts be actually put into Motion, all their other affections remain inefficacious: and ſo in a Key, though it were too big or too little, or if its Shape were incongruous to that of the cavity of the Lock, it would be unfit to be uſ'd as a Key, though it were put into Motion; yet let its bigneſſe and figure be never ſo fit, unleſſe actual Motion intervene, it will never lock or unlock any thing, as without the like actual Motion, neither a Knife nor Raſor will actually cut, how much ſoever their ſhape and other Qualities may fit them to do ſo. And ſo Brimſtone, what diſpoſition of Parts ſoever it have to be turn'd into Flame, would never be kindled, unleſſe ſome actual fire, or other parcel of vehemently and variouſly agitated Matter ſhould put the Sulphureous Corpuſcles into a very briſk motion.

III. Theſe two grand and moſt Catholick Principles of Bodies, Matter and Motion, being thus eſtabliſh'd, it will follow both, that

that Matter must be actually divided into Parts, that being the genuine Effect of variously determin'd Motion, and that each of the primitive Fragments or other distinct and entire Masses of Matter must have two Attributes, its own Magnitude, or rather *Size*, and its own *Figure* or *Shape*. And since Experience shews us (especially that which is afforded us by Chymical Operations, in many of which Matter is divided into Parts, too small to be singly sensible,) that this division of Matter is frequently made into insensible Corpuscles or Particles, we may conclude, that the minutest fragments, as well as the biggest Masses of the Universal Matter are likewise endowed each with its peculiar Bulk and Shape. For being a finite Body, its Dimensions must be terminated and measurable: and though it may change its Figure, yet for the same reason it must necessarily have *some Figure* or other. So that now we have found out, and must admit three Essential Properties of each entire or undivided, though insensible part of Matter, namely *Magnitude*, (by which I mean not quantity in general, but a determin'd quantity, which we in English oftentimes call the *Size* of a Bodie,) *Shape*, and either *Motion* or *Rest*, (for betwixt them two there is no mean:) the two first of which may be called *inseparable Accidents* of each distinct part of Matter: *inseparable*,

rable, becauſe being extended, and yet finite, it is Phyſically impoſſible, that it ſhould be devoid of ſome Bulk or other, and ſome determinate Shape or other; and yet *Accidents*, becauſe that whether or no the Shape can by Phyſicall Agents be alter'd or the Body ſubdivided, yet mentally both the one and the other may be done, the whole eſſence of Matter remaining undeſtroy'd.

Whether theſe Accidents may not conveniently enough be call'd the Moods or primary affections of Bodies, to diſtinguiſh them from thoſe leſſe ſimple Qualities, (as Colours, Taſtes, and Odours,) that belong to Bodies upon their account, or whether with the Epicureans they may not be called the Conjuncts of the ſmalleſt parts of Matter, I ſhall not now ſtay to conſider, but one thing the Modern Schools are wont to teach concerning Accidents is too repugnant to our preſent Doctrine, to be in this place quite omitted, namely that there are in Natural Bodies ſtore of *real Qualities*, and other *real Accidents*, which not onely are no Moods of Matter, but are real Entities diſtinct from it, and according to the doctrine of many modern Schoolmen may *exiſt ſeparate* from all Matter whatſoever. To clear this point a little, we muſt take notice, that *Accident* is among Logicians and Philoſophers uſ'd in two ſeveral ſenſes, for ſometimes it is oppoſ'd

to the 4th Predicable, (*Property,*) and is then defin'd "That which may be present or absent without the destruction of the subject; as a Man may be sick or well, and a Wall white or not white, and yet the one be still a Man, the other a Wall; & this is call'd in the Schools *Accidens prædicabile*, to distinguish it from what they call *Accidens prædicamentale*, which is oppos'd to Substance: for when things are divided by Logicians into *ten* Predicaments or highest Genus'es of things, Substance making one of them, all the Nine other are of Accidents. And as Substance is commonly defin'd to be a thing that subsists of it self, and is the Subject of Accidents, (or more plainly, a real Entity or thing, that needs not any (*created*) Being, that it may exist:) so an Accident is said commonly to be *id cujus esse est inesse*, and therefore *Aristotle*, who usually calls Substances simply ὄντα, Entities, most commonly calls Accidents ὄντα ὄντων, Entities of Entities. These needing the existence of some Substance or other, in which they may be, as in their Subject of Inhæsion. And because Logicians make it the discriminating note of Substance and Accident, that the former is a thing that cannot be in another, as in its subject of Inhæsion, tis requisite to know, that according to them, That is said to *be in a Subject*, which hath these three conditions; That however it (1) *be in another thing*, (2) *is not in it*

it as a part, and (3) *cannot exiſt ſeparately* from the thing or ſubject, wherein it is: as a white Wall is the ſubject of Inhæſion of the whiteneſſe we ſee in it, which ſelf ſame whiteneſſe, though it be not in the Wall as a part of it, yet cannot the ſelf-ſame whiteneſſe according to our Logicians exiſt any where out of the Wall, though many other Bodies may have the like degree of whiteneſſe. This premiſ'd, twill not be hard to diſcover the falſity of the lately mentioned Scholaſtick Opinion touching real Qualities and Accidents, their doctrine about which, does, I confeſſe, appear to me to be either unintelligible, or manifeſtly contradictious: for ſpeaking in a Phyſical ſenſe, if they will not allow theſe Accidents to be Modes of Matter, but Entities really diſtinct from it, and in ſome caſes ſeparable from all Matter, they make them indeed Accidents in name, but repreſent them under ſuch a notion as belongs onely to Subſtances; the nature of a Subſtance conſiſting in this, That it can ſubſiſt of it ſelf, without being in any thing elſe, as in a ſubject of Inhæſion: ſo that to tell us, that a Quality, or other Accident may ſubſiſt without a ſubject, is indeed, whatever they pleaſe to call it, to allow it the true nature of Subſtance, nor will their groundleſſe Diſtinctions doe any more then keep them from ſeeming to contradict themſelves in words, whil'ſt unprepoſſeſs'd perſons

ſee that they do it in effect. Nor could I ever find it intelligibly made out, what theſe real Qualities may be, that they deny to be either Matter or modes of Matter, or immaterial Subſtances. When a Bowl runs along or lies ſtill, that *Motion* or *Reſt* or *Globous figure* of the Bowl is not *Nothing*, and yet is not any *part* of the Bowl; whoſe whole Subſtance would remain, though it wanted which you pleaſe of theſe Accidents: and to make them *real* and *phyſical* Entities, (for we have not here to doe either with *Logical* or *Metaphyſical* ones) is, as if, becauſe we may conſider the ſame Man ſitting, ſtanding, running, thirſtie, hungry, wearie, &c. we ſhould make each of theſe a diſtinct Entity, as we do give ſome of them (as hunger, wearineſs, &c.) diſtinct names. Whereas the ſubject of all theſe Qualities is but the ſame Man as he is conſidered with Circumſtances, that make him appear different in one caſe from what he appears in another: And it may be very uſeful to our preſent Scope to obſerve, that not onely diverſity of *Names* but even diverſity of *Definitions* doth not alwaies infer a diverſity of *Phyſical Entities* in the Subject, whereunto they are attributed. For it happens in many of the Phyſical Attributes of a Body, as in thoſe Other caſes, wherein a Man that is a Father, a Husband, a Maſter, a Prince, &c. may have a peculiar Definition (ſuch as the

the Nature of the thing will bear) belong unto him in each of these Capacities, and yet the Man in himself considered is but the same Man, who in respect of differing Capacities or Relations to other things is call'd by differing Names, and describ'd by various Definitions, which yet (as I was saying) conclude not so many real and distinct Entities in the person so variously denominated.

An EXCURSION *about the* Relative Nature *of* Physical Qualities.

BUt because I take this Notion to be of no small Importance towards the Avoiding of the grand Mistake, that hath hitherto obtain'd about the Nature of Qualities, it will be worth while to Illustrate it a little farther. We may consider then, that when *Tubal-Cain* or whoever else were the Smith, that invented *Locks* and *Keyes*, had made his first Lock, (for we may Reasonably suppose him to have made That before the *Key*, though the Comparison may be made use of without that Supposition,) That was onely a Piece of Iron, contriv'd into such a Shape;

and when afterwards he made a Key to that Lock, That alſo in it ſelf conſider'd was nothing but a Piece of Iron of ſuch a Determinate Figure: but in regard that theſe two pieces of Iron might now be applied to one another after a Certain manner, and that there was a Congruity betwixt the Wards of the Lock and thoſe of the Key, the Lock and the Key did each of them now obtain a new Capacity, and it became a main part of the Notion and Deſcription of a Lock, that it was capable of being made to Lock or Unlock by that other Piece of Iron we call a Key, and it was look'd upon as a Peculiar Faculty and Power in the Key, that it was Fitted to Open and Shut the Lock, and yet by theſe new Attributes there was not added any Real or Phyſical Entity either to the Lock or to the Key, each of them remaining indeed nothing but the ſame piece of Iron, juſt ſo ſhap'd as it was before. And when our Smith made other Keyes of differing Bigneſſes or with differing Wards, though the firſt Lock was not to be open'd by any of thoſe Keyes, yet that Indiſpoſition, however it might be conſider'd as a peculiar Power of reſiſting this or that Key, and might ſerve to diſcriminate it ſufficiently from the Locks thoſe Keyes belong'd to, was nothing new in the Lock, or diſtinct from the Figure it had before thoſe Keyes were made. To carrie this Compariſon a little further

further, let me adde, that though one that would have defin'd the First Lock and the First Key, would have given them distinct Definitions with Reference to each other; and yet (as I was saying) these Definitions being given but upon the score of certain Respects, which the defin'd Bodies had one to another, would not infer, that these two Iron Instruments did Physically differ otherwise then in the Figure, Size, or Contrivement of the Iron, whereof each of them consisted. And proportionably hereunto I do not see, why we may not conceive, that as to those Qualities (for instance) which we call Sensible, though by virtue of a certain Congruity or Incongruity in point of Figure or Texture, (or other Mechanical Attributes,) to our Sensories, the Portions of Matter they Modifie are enabled to produce various Effects, upon whose account we make Bodies to be endow'd with Qualities; yet They are not in the Bodies that are Endow'd with them any Real or Distinct Entities, or differing from the Matter its self, furnish'd with such a Determinate Bigness, Shape, or other Mechanical Modifications. Thus though the modern Gold-Smiths and Refiners reckon amongst the most distinguishing Qualities of Gold, by which men may be certain of its being True and not Sophisticated, that it is easily dissoluble in *Aqua Regis*, and that *Aqua fortis* will not work upon it;

yet these Attributes are not in the Gold any thing distinct from its peculiar Texture, nor is the Gold we have now of any other Nature, then it was in *Pliny*'s time, when *Aqua fortis* and *Aqua Regis* had not been found out, (at least in these parts of the World,) and were utterly unknown to the Roman Gold-Smiths. And this Example I have the rather pitch'd upon, because it affords me an Opportunity to represent, that, unless we admit the Doctrine I have been Proposing, we must Admit, that a Body may have an almost Infinite Number of New Real Entities accruing to it, without the Intervention of any Physical change in the Body its self. As for Example, Gold was the same Natural Body immediately before *Aqua Regis* and *Aqua Fortis* were first made, as it was immediately after, and yet now 'tis reckon'd amongst its Principall Properties, that it is dissoluble by the Former of those two Menstruums, and that it is not like other Mettals Dissoluble or Corrodible by the Latter. And if one should Invent another Menstruum, (as possibly I may think my self Master of such a one) that will but in part dissolve pure Gold, and change some part of it into another Metalline Body, there will then arise another new Property, whereby to distinguish That from other Mettals; and yet the Nature of Gold is not a whit other now, then it was before this last Menstruum was first made.

made. There are ſome Bodies not Cathartick, nor Sudorifick, with ſome of which Gold being joyn'd acquires a Purgative Vertue, and with others a power to procure Sweat; and in a word, Nature her ſelf doth ſometimes otherwiſe, and ſometimes by Chance, produce ſo many things, that have new Relations unto others: And Art, eſpecially aſſiſted by Chymiſtry, may, by variouſly diſſipating Naturall Bodies, or Compounding either them, or their Conſtituent Parts with one another, make ſuch an Innumerable Company of new Productions, that will each of Them have new operations either immediately upon our Senſories, or upon other Bodies, whoſe Changes we are able to perceive, that no man can know but that the moſt Familiar Bodies may have Multitudes of Qualities, that he dreams not of, and a Conſidering man will hardly imagine, that ſo numerous a Croud of reall Phyſical Entities can accrue to a Body, whilſt in the Judgment of all our Senſes it remains Unchang'd, and the ſame that 'twas before.

To clear this a little farther, we may adde, that beaten Glaſſe is commonly reckon'd among Poiſons; and (to skip what is mention'd out of *Sanctorius*, of the Dyſentery procur'd by the Fragments of it) I remember * *Cardan* hath a ſtory, That in a Cloiſter, where he had a Patient then like to die of torments

* *Cardan; Contradict. 9. lib. 2. Tract. 5. apud Schenckium.*

in

in the Stomack, two other Nuns had been already kill'd by a diſtracted Woman, that having caſually got free, had mixt beaten Glaſs with Peaſe, that were eaten by theſe three and divers other of the Siſters(who yet eſcap'd unharm'd.) Now though the powers of Poiſons be not onely look'd upon as *real* Qualities, but are reckoned among the *Abſtruſeſt* ones: yet this Deleterious Faculty, which is ſuppoſ'd to be a Peculiar and ſuperadded Entity in the beaten Glaſs, is really nothing diſtinct ftom the Glaſſe it ſelf, (which though a Concrete made up of thoſe innocent Ingredients, Salt and Aſhes, is yet a hard and ſtiffe Body,) as it is furniſh'd with that determinate Bigneſſe,and Figure of Parts, which have been acquir'd by Comminution. For theſe Glaſſy Fragments being many, and Rigid, and ſomewhat Small, (without yet being ſo ſmall as Duſt,) and endow'd with ſharp Points and cutting Edges, are enabled by theſe Mechanical Affections to pierce or wound the tender Membranes of the Stomach and Guts, and cut the ſlender Veſſels that they meet with there, whereby naturally enſue great Gripings and Contorſions of the injur'd Parts, and oftentimes Bloudy Fluxes occaſion'd by the perforation of the Capillary Arteries, and the great irritation of the Expulſive Faculty, and ſometimes alſo not onely horrid Convulſions by Conſent of the Brain and Cerebellum, with

with ſome of the Nervous or Membranous parts that happen to be hurt, but alſo Dropſies, occaſioned by the great loſs of Bloud we were juſt now ſpeaking of. And it agrees very well with this Conjecture, that beaten Glaſſe hath divers times been obſerv'd to have done no Miſchief to Animals that have ſwallowed it: For there is no reaſon it ſhould, in caſe the Corpuſcles of the Powder either chance to be ſo ſmall, as not to be fit to wound the Guts, which are uſually lin'd with a ſlimy ſubſtance, wherein very minute Powders may be as it were ſheath'd, and by that means hinder'd from hurting the Guts, (inſomuch that a fragment of Glaſſe with three very ſharp corners hath* been obſerv'd to have for above eighteen Months lain inoffenſive even in a nervous and very ſenſible part of the body,) out of which they may with the groſſer Excrements of the lower Belly be harmleſly Excluded, eſpecially in ſome Individuals, whoſe Guts and Stomach too may be of a much ſtronger Texture, and better lin'd or ſtuff'd with groſſe and ſlimy matter, then thoſe of others. And accordingly we ſee, that the Fragments of Saphires, Chryſtals, and even Rubies, which are much

* This memorable Accident happen'd to a Senatour of *Berne*, who was cur'd by the Experienc'd *Fabricius Hildanus*, that gives a long account of it to the Learned *Horſtius*, among whoſe Obſervations tis extant: (*Lib.* 2. *Obſerv.* 35.) who aſcribes the Indolence of the Part, whil'ſt uncompreſs'd, to ſome ſlimy Juice, (familiar enough to thoſe Tendinous parts,) wherein the Glaſſy Fragment was as it were Bedded.

harder

harder then Glaſs, are innocently, though perhaps not very effectually, us'd by Phyſicians, (and I have ſeveral times taken That without Inconvenience) in Cordial Compoſitions, becauſe of their being by Grinding reduc'd to a Powder too ſubtle to excoriate, or grate upon the Stomach or Guts; and probably 'twas upon ſome ſuch Account, that That happen'd which is related by *Cardan* in the ſame place, namely, That though the three Nuns we have been ſpeaking of were poiſon'd by the Glaſſe, yet many others who eat of the other Portions of the ſame mingled Peaſe, receiv'd no miſchief thereby. (But of this ſubject more * elſewhere.)

And this puts me in mind to adde, That the Multiplicity of Qualities, that are ſometimes to be met with in the ſame Natural Bodies, needs not make men reject the Opinion we have been propoſing, by perſwading them, that ſo many Differing Attributes, as may be ſometimes found in one and the ſame Natural Body, cannot proceed from the bare Texture and other Mechanical Affections of its Matter. For we muſt conſider each Body, not barely as it is in it ſelf an entire and diſtinct portion of Matter, but as it is a Part of the Univerſe, and conſequently plac'd among a great Number and Variety of other Bodies,

* In thoſe Notes about Occult Qualities, where the Deleterious Faculty attributed to Diamonds is conſidered.

upon

upon which it may act, and by which it may be acted on in many waies, (or upon many Accounts,) each of which Men are wont to fancy as a distinct Power or Quality in the Body, by which those Actions, or in which those Passions are produc'd. For if we thus consider Things, we shall not much wonder, that a Portion of Matter, that is indeed endow'd but with a very few Mechanical Affections, as such a determinate Texture and Motion, but is plac'd among a multitude of other Bodies, that differ in those Attributes from it and one another, should be capable of having a great number and variety of Relations to those other Bodies, and consequently should be thought to have many Distinct Inherent Qualities, by such as look upon those several Relations or Respects it may have to Bodies without it, as real and distinct Entities implanted in the Body it self. When a curious Watch is going, though the Spring be that which puts all the parts into Motion, yet we do not fancie (as an *Indian* or *Chinois* would perchance do) in this Spring one faculty to move the Index uniformely round the Dial-plate, another to strike the Hour, and perhaps a Third to give an Alarm, or shew the Age of the Moon, or the Tides; all the action of the Spring, (which is but a flexible piece of Steel, forcibly coil'd together,) being but an Endeavour to dilate or unbind its self,

ſelf, and the reſt being perform'd by the various Reſpects it hath to the ſeveral Bodies (that compoſe the Watch) among which it is plac'd, and which they have one to another. We all know, that the Sun hath a power to harden Clay, and ſoften Wax, and melt Butter, and thaw Ice, and turn Water into Vapours, and make Air expand it ſelf in Weather-Glaſſes, and contribute to blanch Linnen, and make the White skin of the Face Swarthy, and mowed Graſſe Yellow, and ripen Fruit, hatch the Eggs of Silk-worms, Caterpillars, and the like Inſects, and perform I know not how many other things, divers of which ſeem contrary Effects, and yet theſe are not diſtinct Powers or Faculties in the Sun, but onely the Productions of its Heat, (which it ſelf is but the brisk, and confuſ'd Local Motion of the Minute parts of a Body,) diverſifi'd by the differing Textures of the Body that it chances to work upon, and the Condition of the other Bodies that are concern'd in the Operation. And therefore whether the Sun in ſome caſes have any Influence at all diſtinct from its Light and Heat, we ſee, that all thoſe *Phænomena* we have thought fit to name are producible by the heat of the common Culinary Fire duely apply'd and regulated. And ſo, to give an *Inſtance* of another Kind, when ſome years ſince, to try ſome Experiments about the Propagation of Motion with

Bodies

Bodies leſſe capable of being batter'd by one another, then thoſe that have been formerly imploy'd, I cauſ'd ſome ſolid Bals of Iron skilfully harden'd and exquiſitely ſhap'd and glaz'd to be purpoſely made; each of theſe poliſhed Bals was a Spherical Looking-Glaſs, which, plac'd in the mid'ſt of a Room, would exhibit the Images of the Objects round about it, in a very regular and pleaſing Perſpective. It would contract the Image, and reflect the Beams of the Sun after a manner differing from Flat and from Convex Looking-Glaſſes. It would in a neat Perſpective leſſen the Image of him that look'd upon it and bend it, and it would ſhew that Image, as if it were behind the Surface, and within the ſolid ſubſtance of the Sphere, and in ſome it had all thoſe Diſtinct, and ſome of them wonderful Properties, which either Antient or Modern Writers of Catoptricks have demonſtrated to belong to Spherical *Specula*, as ſuch: and yet the Globe, furniſh'd with all theſe Properties and Affections, was but the Iron it ſelf reduc'd by the Artificer to a Spherical Figure; (for the Glaſs, that made it Specular, was not diſtinct from the Superficial parts of the Iron, reduc'd all of them to a Phyſically equal diſtance from the Center.) And of *Specula*, Spherical enough to as to ſenſe, you may make ſtore in a trice, by breaking a large Drop of Quick-ſilver into ſeveral little ones, each of which will

ſerve

ſerve for objects plac'd pretty near it, and the ſmaller of which (being the leaſt depreſs'd in the middle by their own weight, and conſequently more perfectly Globous,) may with a good Microſcope plac'd in a Window afford you no unpleaſant proſpect of the neighbouring Objects, and yet to reduce a parcel of Stagnant Quickſilver, which will much emulate a Flat Looking-Glaſſe, into many of theſe little Spherical *Specula*, whoſe Properties are ſo differing from thoſe of Plain ones, there intervenes nothing but a ſleight Local Motion, which in the twinckling of an Eye changeth the Figure of the ſelf ſame Matter.

I have ſaid thus much (*Pyrophilus*) to remove the Miſtake, that *every thing men are wont to call a Quality*, muſt needs be a real and Phyſical Entity, becauſe of the importance of the Subject; and yet I have omitted ſome things that might have been pertinently added, partly becauſe I may hereafter have Opportunity to take them in, and partly becauſe I would not any farther lengthen this *Excurſion*, which yet I muſt not conclude, till I have added this ſhort Advertiſement.

That I have choſen to declare what I mean by Qualities, rather by Examples, then Definitions, *partly* becauſe being immediately or reductively the Objects of ſenſe, men generally underſtand pretty well what one another mean, when they are ſpoken of: (as to ſay, that

that the Taſt of ſuch a thing is Saline or Sowr, or that ſuch a Sound is Melodious, Shrill, or Jarring, (eſpecially if when we ſpeak of Senſible Qualities, we adde ſome enumeration of particular Subjects, wherein they do the moſt eminently reſide,) will make a Man as ſoon underſtood, as if he ſhould go about to give Logical definitions of thoſe Qualities:) and *partly* becauſe the Notions of things are not yet ſo well ſtated and agreed on, but that it is many times difficult to aſſign their true *Genus's*: and *Ariſtotle* himſelf doth not onely define *Accidents* without ſetting down their *Genus*, but when he comes to define *Qualities*, he tels us, that *Quality is that by which a thing is ſaid to be Qualis*, where I would have you take notice both, that in his Definition he omits the *Genus*, and that tis no ſuch eaſie thing to give a very good definition of Qualities, ſince he that is reputed the great Maſter of Logick, where he pretends to give us one, doth but upon the matter define the thing by the ſame thing; for tis ſuppoſ'd to be as little known what *Qualis* is, as what *Qualitas* is, and me thinks he does juſt as if I ſhould define Whiteneſſe to be that, for which a thing is called White, or Vertue, that for which a Man is ſaid to be Vertuous *.

* Since the writing of this, the Author found, that ſome of the Eminenteſt of the Modern Schoolmen themſelves have been as well as he unſatisfied with the Ariſtotelian definition of Quality:

Beſides that, I much doubt whether his Definition be not untrue as well as obſcure, for to the Queſtion, *Qualis res eſt?* Anſwer may be return'd out of *ſome*, if not *all*, of the other *Predicaments of Accidents*: which ſome of the Modern Logicians being aware of, they have endeavoured to ſalve the matter with certain Cautions and Limitations, which however they may argue the Deviſors to be ingenious, do, for ought I can diſcern, leave us ſtill to ſeek for a right and intelligible Definition of Quality in general, though to give ſuch a one be probably a much eaſier Task, then to define many Qualities that may be nam'd in particular, as Saltneſſe, Sowrneſſe, Green, Blew, and many others, which when we hear nam'd, every man knows what is meant by them, though no man

concerning which (not to mention *Revius*, A learned Proteſtant Annotator upon *Suarez*) *Ariaga* ſayes (*diſp. 5. ſect. 2. ſubſ. 1.*) *Per hanc nihil explicatur; nam de hoc quærimus, quid ſit eſſe quale, dices habere qualitatem; bonus Circulus: qualitas eſt id quo quis ſit qualis, & eſſe qualem eſt habere Qualitatem.* And even the famous Jeſuit *Suarez*, though he endeavours to excuſe it, yet confeſſeth, that it leaves the proper Notion of Quality as obſcure to us as before: (*Quæ definitio*, ſaith he, *licèt ea ratione eſſentialis videatur, quod detur per habitudinem ad effectum formalem, quem omnis Forma eſſentialiter reſpicit, tamen quod ad nos ſpectat, æquè obſcura nobis manet propria ratio Qualitatis.*) *Suarez Diſputat. Metaphyſ.* 42. But *Hurtadus* (in his Metaphyſical Diſputations) ſpeaks more boldly, telling us roundly, that it is *Non tam Definitio, quàm inanis quædam Negatio*, which makes me the more wonder, that a famous Carteſian (whom I forbear to name) ſhould content himſelfe to give us ſuch an Inſignificant or at leaſt Superficial Definition of Quality.

(that

(that I know of) hath been able to give accurate Definitions of them.

IV. And if we ſhould conceive, that all the reſt of the Univerſe were annihilated, except any of theſe entire and undivided Corpuſcles, (treated of in the 3d Particular foregoing,) it is hard to ſay what could be attributed to it, beſides Matter, Motion (or Reſt,) Bulk, and Shape; (whence by the way you may take notice, that Bulk, though uſually taken in a comparative ſenſe, is in our ſenſe an abſolute Thing, ſince a Body would have it, though there were no other in the World.) But now there being actually in the Univerſe great Multitudes of Corpuſcles mingled among themſelves, there ariſe in any diſtinct portion of Matter, which a number of them make up, two new Accidents or Events: the one doth more relate to each particular Corpuſcle in reference to the (really or ſuppoſedly) ſtable Bodies about it, namely its *Poſture*; (whether Erected, Inclin'd, or Horizontal:) and when two or more of ſuch Bodies are plac'd one by another, the manner of their being ſo plac'd, as one beſides another or one behind another, may be call'd their *Order*; as I remember, *Ariſtotle* in his Metaphyſicks, *lib.* 1. *cap.* 4. recites this Example out of the Antient Corpuſcularians, That *A and N differ in figure, and A N and N A in Order, Z and N in Scituation*: and indeed Poſture and Order ſeem both of them reduci-

ble to Scituation. And when many Corpuſcles do ſo convene together as to compoſe any diſtinct Body, as a Stone, or a Mettal, then from their other Accidents (or Modes,) and from theſe two laſt mention'd there doth emerge a certain diſpoſition or contrivance of parts in the whole, which we may call the *Texture* of it.

V. And if we ſhould conceive all the reſt of the Univerſe to be annihilated, ſave one ſuch Body, ſuppoſe a Mettal or a Stone, it were hard to ſhew, that there is Phyſically any thing more in it then Matter, and the Accidents we have already named. But now we are to conſider, that there are *de facto* in the world certain ſenſible and rational Beings that we call Men, and the body of Man having ſeveral of its external parts, as the Eye, the Ear, &c. each of a diſtinct and peculiar Texture, whereby it is capable to receive Impreſſions from the Bodies about it, and upon that account it is call'd an organ of Senſe, we muſt conſider, I ſay, that theſe Senſories may be wrought upon by the Figure, Shape, Motion, and Texture of Bodies without them after ſeverall wayes, ſome of thoſe external bodies being fitted to affect the Eye, others the Ear, others the Noſtrils, &c. And to theſe operations of the objects on the Senſories, the mind of man, which upon the account of its union with the body perceives them, giveth diſtinct names, calling the one Light

Light or Colour, the other Sound, the other Odour, &c. And becauſe alſo each organ of Senſe, as the Eye or the Palat, may be it ſelfe differingly affected by external Objects, the mind likewiſe gives the Objects of the ſame Senſe diſtinct Appellations, calling one colour Green, the other Blew, and one taſt Sweet, and another Bitter, &c. Whence men have been induc'd to frame a long Catalogue of ſuch things, as, for their relating to our Senſes, we call Senſible Qualities; and becauſe we have been converſant with them before we had the uſe of Reaſon, and the mind of man is prone to conceive almoſt every Thing (nay even Privations, as Blindneſſe, Death, &c.) under the notion of a true Entitie or Subſtance as it ſelf is; we have been from our Infancy apt to imagine, that theſe Senſible Qualities are real Beings in the Objects they denominate, and have the faculty or power to work ſuch and ſuch things, as Gravity hath a power to ſtop the motion of a Bullet ſhot upwards, and carry that ſolid Globe of Matter toward the Center of the Earth, whereas indeed (according to what we have largely ſhewn above) there is in the Body, to which theſe ſenſible Qualities are attributed, nothing of real and Phyſical but the Size, Shape, and Motion or Reſt of its component Particles, together with that Texture of the whole, which reſults from their being ſo contriv'd as they are; nor is it neceſſary they ſhould

have in them any thing more, like to the Ideas they occasion in us, those Ideas being *either* the Effects of our Prejudices or Inconsiderateness, *or* else to be fetcht from the relation that happens to be betwixt those primary accidents of the sensible Object, and the peculiar texture of the Organ it affects; as when a Pin, being run into my Finger, causeth pain, there is no distinct Quality in the Pin answerable to what I am apt to fancie Pain to be, but the Pin in it self is onely slender, stiff and sharp, and by those qualities happens to make a solution of continuity in my organ of Touching, upon which, by reason of the fabrick of the Body, and the intimate Union of the Soul with it, there ariseth that troublesome kind of Perception which we call Pain, and I shall anon more particularly shew how much that depends upon the peculiar fabrick of the Body.

VI. But here I foresee a Difficulty, which being perhaps the chiefest that we shall meet with against the Corpuscular Hypothesis, it will deserve to be, before we proceed any farther, taken notice of. And it is this, that whereas we explicate Colours, Odours, and the like sensible Qualities by a *relation to our Senses*, it seems evident, that they have an *absolute* Being irrelative to *Us*; for Snow (for instance) would be white, and a glowing Coal would be hot, though there were no Man or any other Animal in the World: and tis plain, that Bodies do

not

not onely by their Qualities work upon *Our ſenſes*, but upon *other*, and thoſe, Inanimate *Bodies*; as the Coal will not onely heat or burn a *Man's hand* if he touch it, but would likewiſe heat Wax, (even ſo much as to melt it and make it flow,) and thaw Ice into Water, although all the Men and ſenſitive Beings in the World were annihilated. To clear this Difficulty, I have ſeveral things to repreſent, and,

1. I ſay not, that there are no other accidents in Bodies then Colours, Odours, and the like; for I have already taught, that there are ſimpler and more primitive Affections of Matter, from which theſe ſecondary Qualities, if I may ſo call them, do depend: and that the Operations of Bodies upon one another ſpring from the ſame we ſhall ſee by and by.

2. Nor do I ſay, that all Qualities of Bodies are *directly Senſible*; but I obſerve, that when one Body works upon another, the knowledge we have of their operation proceeds either from ſome ſenſible Quality, or ſome more Catholick affection of Matter, as Motion, Reſt, or Texture, generated or deſtroy'd in one of them; for elſe it is hard to conceive how we ſhall come to diſcover what paſſes betwixt them.

3. We muſt not look upon every diſtinct Body that works upon our Senſes, as a bare lump of Matter of that bigneſſe and outward ſhape that it appears of; many of them having their parts curiouſly contriv'd, and moſt of them

them perhaps in motion too. Nor muſt we look upon the Univerſe that ſurrounds us as upon a moveleſſe and undiſtinguiſh'd Heap of Matter, but as upon a great Engine, which having either no vacuity, or none that is conſiderable betwixt its parts (known to us,) the actions of particular Bodies upon one another muſt not be barely eſtimated, as if two portions of Matter of their Bulk and Figure were plac'd in ſome imaginary Space beyond the World, but as being ſituate in the World, conſtituted as it now is, and conſequently as having their action upon each other liable to be promoted or hindred or modifi'd by the Actions of other Bodies beſides them: as in a Clock, a ſmall force applied to move the Index to the figure of XII, will make the Hammer ſtrike often and forcibly againſt the Bell, and will make a far greater commotion among the wheels and weights, then a far greater force would do, if the Texture and Contrivance of the Clock did not abundantly contribute to the production of ſo great an Effect. And in agitating water into froth, the whiteneſſe would never be produc'd by that motion, were it not that the ſun, or other lucid body, ſhining upon that aggregate of ſmall Bubbles, enables them to reflect confuſedly great ſtore of little and as it were contiguous lucid images to the Eye. And ſo the giving to a large Metalline Speculum a concave figure, would never enable

able it to ſet Wood on fire, and even to melt down Mettals readily, if the Sun beams, that in cloudleſſe dayes do, as to ſenſe, fill the Air, were not, by the help of that Concavity, thrown together to a Point. And to ſhew You by an eminent Inſtance, how various and how differing Effects the Same action of a Natural Agent may produce, according to the ſeveral diſpoſitions of the Bodies it works upon, do but conſider, that in two Eggs, the one Prolifick, the other Barren, the ſenſe can perhaps diſtinguiſh before Incubation no difference at all; and yet theſe Bodies, outwardly ſo like, do ſo differ in the internall diſpoſition of their parts, that if they be both expoſ'd to the ſame degree of Heat, (whether of a Hen, or an Artificial Oven,) that Heat will change the one into a putrid and ſtinking Subſtance, and the other into a Chick, furniſh'd with great variety of Organical parts of very differing conſiſtences, and curious as well as differing Textures.

4. I do not deny, but that Bodies may be ſaid, in a very favourable ſenſe, to have thoſe Qualities we call Senſible, though there were no Animals in the World: for a Body in that caſe may differ from thoſe Bodies, which now are quite devoid of Quality, in its having ſuch a diſpoſition of its conſtituent Corpuſcles, that in caſe it were duely apply'd to the Senſory of an Animal, it would produce ſuch a ſenſible Quality, which a Body of another Texture would

would not; as though if there were no Animals, there would be no ſuch thing as Pain, yet a Pin may upon the account of its figure be fitted to cauſe pain, in caſe it were mov'd againſt a Man's finger; whereas a Bullet, or other blunt Body mov'd againſt it with no greater force, will not cauſe any ſuch perception of pain. And thus Snow, though if there were no lucid body nor organ of Sight in the World, it would exhibit no Colour at all, (for I could not find it had any in places exactly darkned,) yet it hath a greater diſpoſition then a Coal or Soot to reflect ſtore of Light outwards, when the Sun ſhines upon them all three. And ſo we ſay, that a Lute is in tune, whether it be actually plaid upon or no, if the ſtrings be all ſo duly ſtretcht, as that it would appear to be in Tune, if it were play'd upon: But as if You ſhould thruſt a pin into a man's finger, both a while before and after his Death, though the Pin be as ſharp at one time as at another, and maketh in both caſes alike a ſolution of continuity; yet in the former caſe, the action of the Pin will produce pain, and not in the latter, becauſe in this the prick'd Body wants the Soul, and conſequently the perceptive faculty: ſo if there were no ſenſitive Beings, thoſe Bodies that are now the Objects of our Senſes, would be but *diſpoſitively*, if I may ſo ſpeak, endow'd with Colours, Taſts, and the like; and *actually* but onely with thoſe more Catholick affections of Bodies, Figure, Motion, Texture, *&c.*

To

To illuſtrate this yet a little farther, ſuppoſe a Man ſhould beat a Drum at ſome diſtance from the mouth of a Cave, conveniently ſcituated to return the Noiſe he makes; although Men will preſently conclude, that that Cave hath an Echo, and will be apt to fancy upon that account ſome real Property in the place, to which the Echo is ſaid to belong, and although indeed the ſame Noiſe made in many other of the neighbouring places, would not be reflected to the Eare, and conſequently would manifeſt thoſe places to have no Echos; yet to ſpeak Phyſically of things, this peculiar Quality or Property we fancy in the Cave, is in It nothing elſe but the hollowneſſe of its Figure, whereby 'tis ſo diſpoſ'd, as when the Air beats againſt it, to reflect the Motion towards the place whence that Motion began; and that which paſſeth on this occaſion is indeed but this, that the Drum ſtick falling upon the Drum, makes a percuſſion of the Air, and puts that fluid body into an Undulating motion, and the aery waves thruſting on one another, till they arrive at the hollow Superficies of the Cave, have by reaſon of its reſiſtance and figure their Motion determin'd the contrary way, namely backwards towards that part where the Drum was, when it was ſtruck; ſo that in That, which here happens, there intervenes nothing but the figure of one Body, and the motion of another, though if a Man's Ear chance to be in the way

of

of these Motions of the Air forwards and backwards; it gives him a perception of them, which he calls Sound; and because these perceptions, which are suppos'd to proceed from the same percussion of the Drum, and thereby of the Air, are made at distinct times one after another, that hollow Body, from whence the last Sound is conceiv'd to come to the Air, is imagin'd to have a peculiar Faculty, upon whose account men are wont to say, that such a place hath an Echo.

5. And whereas one Body doth often seem to produce in another divers such Qualities, as we call Sensible, which Qualities therefore seem not to need any reference to our Senses, I consider, that when one Inanimate Body works upon another, there is nothing really produc'd by the Agent in the Patient, save some Local Motion of its Parts, or some change of Texture consequent upon that Motion; and so, if the Patient come to have any sensible Quality, that it had not before, it acquires it upon the same account, upon which other Bodies have it, and it is but a consequent to this Mechanicall change of Texture, that by means of its Effects upon our organs of Sense, we are induc'd to attribute this or that sensible Quality to it. *As* in case a Pin should chance by some inanimate Body to be driven against a man's Finger, that which the Agent doth, is but to put a sharp and slender Body into such a kind of Motion, and that which

which the Pin doth, is to pierce into a Body that it meets with, not hard enough to reſiſt its Motion, and ſo that upon this there ſhould enſue ſuch a thing as pain, is but a conſequent, that ſuperadds nothing of real to the Pin that occaſions that pain: *So* if a piece of tranſparent Ice be, by the falling of ſome heavy and hard Body upon it, broken into a groſſe Powder that looks Whitiſh, the falling Body doth nothing to the Ice but break it into very ſmall Fragments, lying confuſedly upon one another; though by reaſon of the fabrick of the World and of our Eyes, there doth in the day time upon this Comminution enſue ſuch a kind of copious Reflection of the incident Light to our Eyes, as we call Whiteneſſe: and when the Sun, by thawing this broken Ice, deſtroyes the whiteneſſe of that portion of Matter, and makes it become Diaphanous, which it was not before, it doth no more then alter the Texture of the Component parts, by putting them into Motion, and thereby into a new Order; in which, by reaſon of the diſpoſition of the Pores intercepted betwixt them, they reflect but few of the incident beams of Light, and tranſmit moſt of them. Thus when with a Burniſher You poliſh a rough piece of Silver, that which is really done, is but the depreſſion of the little protuberant parts into one Level with the reſt of the Superficies; though upon this Mechanicall change of the Texture of the Superficiall

parts,

parts, we Men say, that it hath lost the Quality of roughnesse; and acquir'd that of smoothnesse, because that, whereas before the little Exstancies by their Figure resisted a little the Motion of our Finger and grated upon them a little, our Fingers now meet with no such offensive Resistance. 'Tis true that the Fire doth thaw Ice, and also both make Wax flow, and enable it to burn a Man's hand, and yet this doth not necessarily argue in it any Inherent Quality of Heat, distinct from the Power it hath of putting the small parts of the Wax into such a Motion, as that their agitation surmounts their cohesion; which Motion, together with their Gravity, is enough to make them *pro tempore* constitute a Fluid Body: and *Aqua Fortis*, without any (sensible) Heat, will make Camphire cast on it assume the forme of a Liquor distinct from it; as I have try'd, that a strong Fire will also make Camphire fluid: not to adde, that I know a liquor, into which certain bodies being put, when both it self (as well as they) is *actually cold*, (and consequently when You would not suspect it of an Actual inherent Heat) will not onely speedily dissipate many of their parts into Smoak, but leave the rest Black, and burnt almost like a Coal. So that though we suppose the Fire to do no more then variously and briskly to agitate the insensible parts of the Wax, That may suffice to make us think the Wax endow'd with a Quality of

of Heat: becauſe if ſuch an Agitation be greater then that of the Spirit, and other parts of our organs of Touching, That is enough to produce in us that Senſation we call Heat; which is ſo much a Relative to the Senſory which apprehends it, that we ſee, that the ſame lukewarm water, that is, whoſe Corpuſcles are moderately agitated by the Fire, will appear hot to one of a Man's hands, if That be very cold, and cold to the other, in caſe it be very hot, though both of them be the ſame Man's hands. To be ſhort, if we fancy any two of the Bodies about us, as a Stone, a Mettal, &c. to have nothing at all to do with any other Body in the Univerſe, tis not eaſie to conceive; either how one can act upon the other, but by local motion (of the whole Body, or its corporeal Effluvia;) or how by Motion it can do any more, then put the parts of the other body into motion too, and thereby produce in them a change of Scituation and Texture, or of ſome other of its Mechanical Affections: though this (paſſive) Body being plac'd among other Bodies in a World conſtituted as ours now is, and being brought to act upon the moſt curionſly contriv'd Senſories of Animals, may upon both theſe accounts exhibit many differing ſenſible *Phænomena*; which however we look upon them as diſtinct Qualities, are conſequently but the Effects of the often mention'd Catholick affections of Matter, and deducible from

from the Size, Shape, Motion (or Reſt,) Poſture, Order, and the reſulting Texture of the inſenſible parts of Bodies. And therefore though, for ſhortneſſe of ſpeech, I ſhall not ſcruple to make uſe of the word *Qualities*, ſince it is already ſo generally receiv'd, yet I would be underſtood to mean them in a ſenſe ſuitable to the Doctrine above deliver'd. As if I ſhould ſay, that Roughneſſe is apt to grate and offend the Skin, I ſhould mean, that a File or other Body, by having upon its Surface a multitude of little hard and exſtant Parts, and of an Angular or ſharp Figure, is quality'd to work the mention'd Effect: and ſo if I ſhould ſay, that Heat melts Mettals, I ſhould mean, that this fuſion is effected by Fire, or ſome other Body, which by the various and vehement Motion of its inſenſible parts does to us appear Hot. And hence, (by the way,) I preſume You will eaſily gueſſe at what I think of the Controverſy ſo hotly diſputed of late betwixt two parties of Learned Men, whereof the One would have all Accidents to worke onely in virtue of the Matter they reſide in, and the Other would have the Matter to act onely in virtue of its Accidents: for conſidering, that on the one ſide, the Qualities, we here ſpeak of, do ſo depend upon Matter, that they cannot ſo much as have a Being but in, and by it; and on the other ſide, if all Matter were but quite devoid of Motion, (to name now no other Accidents,) I do not readily conceive; how

how it could operate at all, I think it is safeſt to conclude, that neither Matter, nor Qualities apart, but both of them conjointly do perform, what we ſee done by Bodies to one another, according to the doctrine of Qualities juſt now deliver'd.

Of the Nature of a Forme.

VII. WE may now advance ſomewhat farther, and conſider, that Men having taken notice that certain conſpicuous Accidents were to be found aſſociated in ſome Bodies, and other conventions of Accidents in other bodies, they did for conveniency and for the more expeditious expreſſion of their Conceptions agree to diſtinguiſh them into ſeveral ſorts, which they call *Genders* or *Species*, according as they referr'd them either upwards to a more comprehenſive ſort of Bodies, or downward to a narrower Species, or to Individuals: as, obſerving many Bodies to agree in being fuſible, malleable, heavy, and the like, they gave to that ſort of body the name of *Metal*, which is a *Genus* in reference to Gold, Silver, Lead, and but a *Species* in reference to that ſort of mixt Bodies they call *Foſſilia*: this *ſuperior Genus* comprehending both Metals, Stones, and diverſe other concretions, though it ſelf be but a *Species* in reſpect of mixt Bodies. Now when any Body is referr'd to any parti-

cular *species*, (as of a Metal, a Stone, or the like, becauſe Men have for their convenience agreed to ſignifie all the Eſſentials requiſite to conſtitute ſuch a Body by one Name, moſt of the Writers of Phyſicks have been apt to think, that beſides the common Matter of all Bodies, there is but one thing that diſcriminates it from other kinds, and makes it what it is, and this for brevities ſake they call a *Forme*; which becauſe all the Qualities and other Accidents of the Body muſt depend on it, they alſo imagine to be a very Subſtance, and indeed a kind of Soule, which united to the groſſe Matter compoſes with it a Natural Body, and acts in it by the ſeveral Qualities to be found therein, which men are wont to aſcribe to the creature ſo compoſ'd. But as to this affair, I obſerve, that if (for inſtance) You ask a Man what Gold is, if he cannot ſhew you a piece of Gold, and tell you, This is Gold, he will deſcribe it to You as a Body, that is extremely ponderous, very malleable and ductile, fuſible and yet fixt in the Fire, and of a yellowiſh colour, and if you offer to put off to him a piece of Braſſe for a piece of Gold, he will preſently refuſe it, and (if he underſtand Metals) tell you, that though your Braſſe be coloured like it, tis not ſo heavy, nor ſo malleable, neither will it like Gold reſiſt the utmoſt brunt of the Fire, or reſiſt *Aqua fortis*: and if you ask men what they mean by a Ruby, or Nitre,

or

or a Pearl, they will ſtill make you ſuch anſwers, that you may clearly perceive, that whatever men talk in Theory of ſubſtantial Formes, yet That, upon whoſe account they really diſtinguiſh any one Body from others, and refer it to this or that *Species* of Bodies, is nothing but an Aggregate or convention of ſuch Accidents, as moſt men do by a kind of agreement (for the thing is more arbitrary then we are aware of) think neceſſary or ſufficient to make a portion of the Univerſal Matter belong to this or that determinate *Genus* or *Species* of Natural Bodies. And therefore not onely the generality of Chymiſts, but diverſe Philoſophers, and, what is more, ſome Schoolmen themſelves, maintain it to be poſſible to tranſmute the ignobler Metals into Gold; which argues, that if a man could bring any parcel of Matter to be yellow, and malleable, and ponderous, and fixt in the fire, and upon the Teſt, and indiſſoluble in *Aqua fortis*, and in ſome to have a concurrence of all thoſe Accidents, by which men try true Gold from falſe, they would take it for true Gold without ſcruple. And in this caſe the generality of mankind would leave the School-Doctors to diſpute, whether being a Factitious Body, (as made by the Chymiſts art,) it have the ſubſtantial Form of Gold, and would upon the account of the convention of the freſhly mention'd Accidents, let it paſſe current amongſt them,

notwithſtanding moſt mens greater care not to be deceived in a matter of this nature then in any other. And indeed ſince to every determinate *Species* of Bodies there doth belong more then one Quality, and for the moſt part a concurrence of many is ſo Eſſential to that ſort of Bodies, that the want of any one of them is ſufficient to exclude it from belonging to that *Species*, there needs no more to diſcriminate ſufficiently any one kind of Bodies from all the Bodies in the world that are not of that kind; as the Chymiſts *Luna fixa*, which they tell us wants not the weight, the malleableneſſe, nor the fixtneſſe, nor any other property of Gold, except the yellowneſſe, (which makes them call it white Gold,) would by reaſon of that want of colour be eaſily known from true Gold. And you will not wonder at this, if you conſider, that though Spheres and Parallelopipedons differ but in ſhape, yet this difference alone is the ground of ſo many others, that *Euclid* and other Geometricians have demonſtrated I know not how many properties of the one, which do no way belong to the other; and **Ariſtotle* himſelfe ſomewhere tells us, that a Sphere is compoſed of Braſſe and Roundneſſe. And I ſuppoſe it would be thought a man's own fault, if he could not diſtinguiſh a Needle from a File, or a Key from a pair of Sciſſors, though theſe being all made of Iron and dif-

* Ariſt. Metaph. lib. 7. cap. 8.

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fering but in bigneſſe and ſhape, are leſſe remarkably diverſe then Natural bodies, the moſt part of which differ from each other in far more Accidents then two. Nor need we think that Qualities being but Accidents, they cannot be *eſſential* to a Natural body; for Accident, as I formerly noted, is ſometimes oppoſ'd to Subſtance, and ſometimes to Eſſence: and though an Accident cannot be but accidental to Matter, as it is a Subſtantial thing, yet it may be eſſential to this or that particular body; as in *Ariſtotle*'s newly mention'd example, though Roundneſſe is but accidental to Braſſe, yet tis eſſential to a braſen Sphere; becauſe, though the Braſſe were devoid of roundneſſe, (as if it were Cubical, or of any other figure,) it would ſtill be a corporeal Subſtance, yet without that roundneſſe it could not be a Sphere: wherefore ſince an aggregate or convention of Qualities is enough to make the portion of Matter tis found in what it is, and denominate it of this or that determinate ſort of Bodies; and ſince thoſe Qualities, as we have ſeen already, do themſelves proceed from thoſe more primary and catholick affections of Matter, Bulk, Shape, Motion or Reſt, and the Texture thence reſulting, why may we not ſay, that the Forme of a Body being made up of thoſe Qualities united in one Subject doth likewiſe conſiſt in ſuch a convention of thoſe newly nam'd Mechanical affections of Matter, as is

neceſſary to conſtitute a Body of that determinate kind. And ſo, though I ſhall for brevities ſake retain the word *Forme*, yet I would be underſtood to mean by it, not a real *Subſtance* diſtinct from Matter, but onely the Matter it ſelfe of a Natural Body, conſider'd with its peculiar manner of Exiſtence, which I think may not inconveniently be call'd either its *Specifical* or its *Denominating State*, or its *Eſſential Modification*, or, if you would have me expreſſe it in one word, its *Stamp:* for ſuch a convention of Accidents is ſufficient to perform the offices that are neceſſarily requir'd in what men call a Forme, ſince it makes the body ſuch as it is, making it appertain to this or that determinate Species of bodies, and diſcriminating it from all other Species of Bodies whatſoever: as for inſtance, Ponderouſneſſe, Ductility, Fixtneſſe, Yellowneſſe, and ſome other Qualities concurring in a portion of Matter, do with it conſtitute Gold, and making it belong to that Species we call Metals, and to that ſort of Metals we call Gold, do both denominate and diſcriminate it from Stones, Salts, Marchaſites, and all other ſorts of Bodies that are not metals, and from Silver, Braſſe, Copper, and all metals except Gold. And whereas tis ſaid by ſome, that the Forme alſo of a Body ought to be the principle of its operation, we ſhall hereafter conſider in what ſenſe That is to be remitted or rejected; in the mean time

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it may ſuffice us, that even in the vulgar Philoſophy 'tis acknowledg'd, that Natural things for the moſt part operate by their Qualities, as Snow dazles the eyes by its whiteneſſe, and Water ſcatter'd into drops of rain falls from the Clouds upon the account of its Gravity. To which I ſhall adde, that how great the power may be, which a Body may exerciſe by virtue of a ſingle Quality, may appear by the various and oftentimes prodigious effects, which fire produces by its heat, when thereby it melts Metals, calcines Stones, deſtroyes whole woods and Cities &c. And if ſeveral active Qualities convene in one Body, (as that which in our Hypotheſis is meant by Forme uſually compriſes ſeveral of them,) what great things may be thereby perform'd, may be ſomewhat gueſs'd at by the ſtrange things we ſee done by ſome Engines, which, being as Engines, undoubtedly devoid of Subſtantial Forms, muſt do thoſe ſtrange things they are admir'd for, by vertue of thoſe Accidents, the Shape, Size, Motion, and Contrivance of their parts. Not to mention, that in our Hypotheſis, beſides thoſe operations that proceed from the Eſſential Modification of the Matter, as the body (compoſ'd of Matter and neceſſary Accidents) is conſider'd *per modum unius*, as one entire Corporeal Agent, it may in diverſe caſes have other operations, upon the account of thoſe particular Corpuſcles, which though they concurre to

compoſe it, and are in reference to the whole conſider'd but as its parts, may yet retain their own particular nature and diverſe of the peculiar Qualities: as in a Watch, beſides thoſe things which the Watch performes as ſuch, the ſeveral parts whereof it conſiſts as the Spring, the Wheels, the String, the Pins, &c. may have each of them its peculiar Bulk, Shape, and other attributes, upon the account of one or more of which the Wheel or Spring &c. may do other things then what it doth, as meerly a conſtituent part of the Watch. And ſo in the milk of a Nurſe, that hath ſome hours before taken a Potion, though the Corpuſcles of the purging medicine appear not to ſenſe diſtinct from the other parts of the milk, which in far greater numbers concurre with them to conſtitute that white liquor, yet theſe Purgative particles, that ſeem to be but part of the Matter whereof the Milk conſiſts, do yet ſo retain their own nature and qualities, that being ſuck'd in with the reſt by the Infant, they quickly diſcriminate and diſcover themſelves by purging him. But of this ſubject more hereafter.

(Of Generation, Corruption, and Alteration.)

VIII. IT now remains that we declare, what, according to the tenour of our Hypotheſis

theſis, is to be meant by *Generation*, *Corruption*, and *Alteration*; (Three Names, that have very much puzzled and divided Philoſophers.) In order hereunto we may conſider,

1. That there are in the World great ſtore of Particles of Matter, each of which is too ſmall to be, whilſt ſingle, Senſible; and being Entire or Undivided, muſt needs both have its Determinate Shape, and be very Solid. Inſomuch, that though it be *mentally*, and by Divine Omnipotence diviſible, yet by reaſon of its Smalneſſe and Solidity, Nature doth ſcarce ever actually divide it; and theſe may in this ſenſe be call'd *Minima* or *Prima Naturalia*.

2. That there are alſo Multitudes of Corpuſcles, which are made up of the Coalition of ſeveral of the former *Minima Naturalia*; and whoſe Bulk is ſo ſmall, and their Adheſion ſo cloſe and ſtrict, that each of theſe little Primitive Concretions or Cluſters (if I may ſo call them) of Particles is ſingly below the diſcernment of Senſe, and though not abſolutely indiviſible by Nature into the *Prima Naturalia* that compoſ'd it, or perhaps into other little Fragments, yet, for the reaſons freſhly intimated, they very rarely happen to be actually diſſolv'd or broken, but remain entire in great variety of ſenſible Bodies, and under various formes or diſguiſes. As, not to repeat, what we lately mention'd, of the undeſtroy'd purging Corpuſcles of Milk; we ſee, that even Groſſer and more compounded

compounded Corpuſcles may have ſuch a permanent texture: For Quickſilver, for inſtance, may be turn'd into a red Powder for a Fuſible and Malleable Body, or a Fugitive Smoak, and diſguis'd I know not how many other wayes, and yet remain true and recoverable Mercury. And theſe are as it were the ſeeds or immediate principles of many ſorts of Natural Bodies, as Earth, Water, Salt, *&c.* and thoſe ſingly inſenſible, become capable, when united, to affect the Senſe: as I have try'd, that if good Camphire be kept a while in pure Spirit of Wine, it will thereby be reduc'd into ſuch Little parts, as totally to diſappear in the Liquor, without making it look leſſe clear then fair Water, and yet, if into this Mixture you pour a competent quantity of Water, in a moment the ſcatter'd Corpuſcles of the Camphire will, by reuniting themſelves, become White, and conſequently Viſible, as before their Diſperſion.

3. That as well each of the *Minima Naturalia*, as each of the Primary Cluſters above mention'd, having its own determinate bulk and ſhape, when theſe come to adhere to one another, it muſt *alwayes* happen, that the Size, and *often*, that the Figure of the Corpuſcle compos'd by their Juxta-poſition and Coheſion, will be chang'd: and *not ſeldome* too, the Motion either of the one, or the other, or both, will receive a new tendency

tendency, or be alter'd as to its Velocity or otherwiſe: and the like will happen, when the Corpuſcles, that compoſe a Cluſter of Particles, are disjoyn'd, or any thing of the little Maſſe is broken off. And whether any thing of Matter be added to a Corpuſcle, or taken from it in either caſe, (as we juſt now intimated,) the Size of it muſt neceſſarily be alter'd, and for the moſt part the Figure will be ſo too, whereby it will both acquire a congruity to the Pores of ſome Bodies, (and perhaps ſome of our Senſories,) and become incongruous to thoſe of others, and conſequently be qualify'd, as I ſhall more fully ſhew you hereafter, to operate on diverſe occaſions, much otherwiſe then it was fitted to do before.

4. That when many of theſe inſenſible Corpuſcles come to be aſſociated into one viſible Body, if many or moſt of them be put into Motion, from what cauſe ſoever the Motion proceeds, That it ſelf may produce great Changes, and new Qualities in the Body they compoſe; for *not onely* Motion may perform much, even when it makes not any viſible alteration in it, as Air put into ſwift motion, (as when it is blown out of Bellowes) acquires a new name, and is call'd *Wind*, and to the Touch appears far colder then the ſame *Air* not ſo form'd into a Stream: and Iron, by being briskly rubb'd againſt Wood or other Iron, hath its ſmall parts ſo agitated, as to appear hot to our Senſe:

but

but this motion oftentimes makes visible Alterations in the Texture of the Body into which it is receiv'd, for alwaies the Moved parts strive to communicate their Motion, or somewhat of the degree of it, to some parts that were before either at Rest, or otherwise mov'd, and oftentimes the same Mov'd parts do thereby either disjoyn, or break some of the Corpuscles they hit against, and thereby change their Bulk, or Shape, or both, and either drive some of them quite out of the Body, and perhaps lodge themselves in their places, or else associate them anew with others. Whence it usually followes, that the Texture is for a while at least, and, unless it be very stable and permanent, for good and all, very much alter'd, and especially in that the Pores or little Intervals intercepted betwixt the component Particles will be chang'd as to Bigness, or Figure, or both, and so will cease to be commensurate to the Corpuscles that were fit for them before, and become commensurate to such Corpuscles of other Sizes and Shapes, as till then were incongruous to them. Thus we see that Water, by loosing the wonted agitation of its parts, may acquire the Firmness and Brittleness we find in Ice, and loose much of the Transparency it had whilst it was a Liquor. Thus also by very hard rubbing two pieces of Resinous Wood against one another, we may make them throw out diverse of their looser parts into Steams and

and visible Smoak, and may, if the Attrition be duely continued, make that commotion of the parts so change the Texture of the whole, as afterwards to turn the superficial parts into a kind of Coal. And thus Milk, especially in hot weather, will by the intestine, though languid, Motions of its parts, be in a short time turn'd into a thinner sort of liquor then Milk, and into Cream, and this (last nam'd) will, by being barely agitated in a Churn, be turn'd in a shorter time into that Unctuous and consistent Body we call Butter, and into thin, fluid, and sower Butter-milk. And thus (to dispatch) by the bruising of Fruit, the Texture is commonly so chang'd, that, as we see particularly in Apples, the Bruis'd part soon comes to be of another nature then the Sound part, the one differing from the other both in Colour, Tast, Smell, and Consistence. So that (as we have already inculcated) *Local Motion* hath, of all other affections of Matter, the greatest Interest in the Altering and Modifying of it, since it is not onely the Grand *Agent* or *Efficient* among Second Causes, but is also oftentimes one of the principall things that *constitutes the Forme* of Bodies: as when two Sticks are set on fire by long and vehement Attrition, Local *Motion* is not onely that which kindles the Wood, and so as an Efficient produces the Fire, but is That which principally concurres to give the produced Stream of shining Matter, the name

and

and nature of Flame: and ſo it concurrs alſo to conſtitute all Fluid Bodies.

5. And that ſince we have formerly ſeen, that 'tis from the Size, Shape, and Motion of the ſmall parts of Matter, and the Texture that reſults from the manner of their being diſpoſ'd in any one Body, that the Colour, Odour, Taſte, and other qualities of that Body are to be deriv'd, it will be eaſie for us to recollect, That ſuch Changes cannot happen in a portion of Matter, without ſo much varying the Nature of it, that we need not deride the antient Atomiſts, for attempting to deduce the *Generation* and *Corruption* of Bodies from the fam'd συγκρισις & διακρισις, the *Convention* and *Diſſolution*, and the *Alterations* of them, from the *tranſpoſition* of their (ſuppoſ'd) Atoms: For though indeed Nature is wont in the Changes ſhe makes among things Corporeal, to imploy all the *three* wayes, as well in *Alterations*, as *Generations* and *Corruptions*; yet if they onely meant, as probably enough they did, that of the *three* waies propoſ'd, the Firſt was wont to be the Principal in the *Generation* of Bodies, the ſecond in the *Corruption*, and the third in their *Alterations*, I ſhall not much oppoſe this Doctrine: though I take the Local Motion or *Tranſpoſition* of Parts in the ſame portion of Matter to bear a great ſtroke as well in reference to *Generation* and *Corruption*, as to *Alteration*: as we ſee when Milk or Fleſh or fruit, without any remarkable addition

addition or losse of parts turns into Maggots, or other Insects; and as we may more conspicuously observe in the Precipitation of Mercury without addition, in the Vitrification of Metals, and other Chymical Experiments to be hereafter mention'd.

These things premis'd, it will not now be difficult to comprise in few words such a Doctrine, touching the *Generation*, *Corruption*, and *Alteration* of Bodies, as is suitable to our *Hypothesis* and the former Discourse. For if in a parcel of Matter there happen to be produc'd (it imports not much how) a Concurrence of all those Accidents, (whether those onely or more) that Men by tacite agreement have thought *necessary* and *sufficient* to constitute any one Determinate *Species* of things corporeal, then we say, that a Body belonging to that *Species*, as suppose a Stone, or a Metal, is *Generated* or produc'd *de novo*. Not that there is really any thing of *Substantial* produc'd, but that those parts of Matter, that did indeed before præexist, but were either scatter'd and shar'd among other Bodies, or at least otherwise disposs'd of, are now brought together, and dispos'd of after the manner requisite, to entitle the Body that results from them to a *new Denomination*, and make it appertain to such a Determinate *Species* of Natural Bodies, so that no new *Substance* is in Generation *produc'd*, but onely That, which was *præexistent*, obtains a new *Modification*, or manner

ner of Exiſtence. Thus when the Spring, and Wheels, and String, and Ballance, and Index, *&c.* neceſſary to a Watch, which lay before ſcatter'd, ſome in one part, ſome in another of the Artificer's Shop, are firſt ſet together in the order requiſite to make ſuch an Engine, to ſhew how the time paſſes, a watch is ſaid to be *made*: not that any of the mention'd Material parts is *produc'd de novo*, but that till then the divided Matter was not ſo *contriv'd* and put together, as was requiſite to conſtitute ſuch a thing, as we call a Watch. And ſo when Sand and Aſhes are well melted together, and ſuffer'd to cool, there is generated by the colliquation that ſort of Concretion we call *Glaſſe*, though it be evident, that its Ingredients were both præexiſtent, and do but by their *Aſſociation* obtain a New manner of exiſting together. And ſo when by the Churning of Creame, Butter and Butter-milk are generated, we find not any thing Subſtantial Produc'd *de novo* in either of them, but onely that the *Serum*, and the fat Corpuſcles, being put into Local Motion, do by their frequent Occurſions extricate themſelves from each other, and aſſociate themſelves in the new manner, requiſite to conſtitute the Bodies, whoſe names are given them.

And as a Body is ſaid to be *generated*, when it firſt appears clothed with all thoſe Qualities, upon whoſe Account Men have been pleas'd to call ſome Bodies *Stones*; others, *Mettals*; others, *Salts*,

Salts, &c. ſo when a Body comes to looſe *all* or *any* of thoſe Accidents that are *Eſſential*, and neceſſary to the conſtituting of ſuch a Body, it is then ſaid to be *corrupted* or deſtroy'd, and is no more a Body of *that Kind*, but looſes its title to its former Denomination. Not that any thing *Corporeal* or Subſtantial *periſhes* in this *Change*, but onely that the Eſſential modification of the Matter is deſtroy'd: and though the Body be ſtill a *Body*, (no Natural Agent being able to *annihilate* Matter,) yet 'tis no longer *ſuch a Body*, as 'twas before, but periſheth in the capacity of a Body of that Kind. Thus if a Stone, falling upon a Watch, break it to pieces, *as*, when the Watch was made there was no new Subſtance produc'd, all the Material parts (as the Steel, Braſſe, String, *&c.*) being præexiſtent ſomewhere or other, (as in Iron and Copper-Mines, in the Bellies of thoſe Animals, of whoſe Guts Men uſe to make Strings;) *ſo* not the leaſt part of the Subſtance of the Watch is loſt, but onely diſplac'd and ſcatter'd; and yet that portion of Matter ceaſes to be a *Watch* as it was before. And ſo (to reſume our late Example) when Creame is by churning turn'd into Butter, and a ſerous liquor, the parts of the Milk remain aſſociated into thoſe two Bodies but the white liquor periſheth in the capacity of Milk. And ſo when Ice comes to be thaw'd in exactly clos'd Veſſels, though the Corruption be produc'd

onely (for ought appears) by introducing a new Motion and Disposition into the parts of the frozen Water, yet it thereupon ceases to be *Ice*, however it be as much *Water*, and consequently as much a *Body*, as before it was frozen or thaw'd: These and the like Examples may teach us rightly to understand that common Axiom of Naturalists, *Corruptio unius est generatio alterius; & è contrà*: for since it is acknowledged on all hands, that Matter cannot be annihilated, and since it appears by what we have said above, that there are some Properties, namely *Size*, *Shape*, *Motion*, (or in its absence, *Rest*,) that are inseparable from the actuall parts of Matter; and since also the Coalition of any competent number of these parts is sufficient to constitute a Natural Body, endow'd with diverse sensible Qualities; it can *scarce* be otherwise, but that the same Agents, that shatter the Frame, or *destroy* the Texture of one Body, will by shuffling them together, and disposing them after a New manner, bring them to *constitute* some new sort of Bodies: As the same thing, that by burning destroyes Wood, turns it into Flame, Soot, and Ashes. Onely I doubt, whether the Axiome do generally hold true, if it be meant, That *every Corruption must end in the Generation of a Body, belonging to some particular Species of things*, unless we take Powders and fluid Bodies indefinitely for *Species* of Naturall Bodies; since it is plain, there are multitudes of Vegetables,

and

and other Concretions, which, when they rot, do not, as ſome others do, turn into Worms, but either into ſome ſlimy or watery Subſtance, or elſe (which is the moſt uſuall) they crumble into a kind of Duſt or Powder, which, though look'd upon as being the Earth, into which rotten Bodies are at length reſolv'd, is very farre from being of an Elementary nature, but as yet a Compounded Body, retaining ſome, if not many, Qualities, which often makes the Duſt of one ſort of Plant or Animal differ much from that of another. And This will ſupply me with this Argument *Ad hominem*, viz. That ſince in thoſe *violent Corruptions* of Bodies, that are made by Outward Agents, ſhattering them into pieces, if the Axiome hold true, the New *Bodies emergent* upon the diſſolution of the Former, muſt be really *Natural Bodies*, as (indeed divers of the Moderns hold them to be,) and generated according to the courſe of Nature; as when Wood is deſtroy'd by Fire, and turn'd partly into Flame, partly into Soot, partly into Coals, and partly into Aſhes, I hope we may be allow'd to conclude, that thoſe *Chymicall Productions*, which ſo many would have to be but *Factitious Bodies*, are *Natural ones*, and regularly generated. For it being the ſame Agent, the Fire, that operates upon Bodies, whether they be expoſ'd to it in cloſe Glaſſes, or in Chimnies, I ſee no ſufficient reaſon, why the Chymical Oyls,

and Volatile Salts, and other things which Spagyrites obtaine from mixt Bodies, ſhould not be accounted Natural Bodies, as well as the Soot and Aſhes and Charcoal, that by the ſame Fire are obtain'd from kindled Wood.

But before we paſſe away from the mention of the Corruption of Bodies, I muſt take ſome notice of what is call'd their *Putrefaction*. This is but a Peculiar kind of Corruption, wrought ſlowly (whereby it may be diſtinguiſh'd from deſtruction by Fire, and other nimble Agents) in Bodies: it happens to them for the moſt part by means of the Air, or ſome other ambient Fluid, which by penetrating into the Pores of the Body, and by its agitation in them, doth uſually call out ſome of the more agile and leſſe entangled parts of the Body, and doth almoſt ever looſen and diſlocate the parts in general, and thereby ſo change the Texture, and perhaps too the Figure, of the Corpuſcles, that compoſe it, that the Body, thus chang'd, acquires Qualities unſuitable to its former Nature, and for the moſt part offenſive to Our Senſes, eſpecially of Smelling and Taſting: which laſt clauſe I therefore adde, not onely becauſe the Vulgar look not upon the Change of an Egge into a Chick as a *Corruption*, but as a *Perfection* of the Egge; but becauſe alſo I think it not improbable, that if by ſuch ſlow Changes of Bodies, as make them looſe their former Nature,

ture, and might otherwiſe paſſe for *Putrefaction*, many Bodies ſhould acquire better Sents or Taſts then before; or if Nature, Cuſtome, or any other cauſe ſhould much alter the Texture of our Organs of Taſting and Smelling, it would not perhaps be ſo well agreed on what ſhould be call'd Putrefaction, as that imports an *impairing Alteration*, but Men would find ſome favourabler notion for ſuch changes For I obſerve, that Medlars, though they acquire in length of time ſuch a Colour and Softneſſe as rotten Apples, and other putrify'd Fruits do, yet, becauſe their Taſt is not then harſh as before, we call that *Ripeneſſe* in them, which otherwiſe we ſhould call *Rottenneſſe*. And though upon the Death of a fourfooted Beaſt, wee generally call that change, which happens to the Fleſh or Bloud, Putrefaction, yet we paſſe a more favourable judgment upon That, which happens to the Fleſh and other ſofter parts of that Animal, (whether it be a kind of large Rabbets, or very ſmall and hornleſſe Deer,) of which in *China*, and in the *Levant* they make Muſk; becauſe by the change, that enſues the Animals death, the Fleſh acquires not an *odious*, but a *gratefull ſmell*. And we ſee, that ſome Men, whoſe appetites are gratified by Rotten Cheeſe, think it then not to have *degenerated*, but to have attain'd its *beſt ſtate*, when having loſt its former Colour, Smell, and Taſt, & which is more, being in great part turn'd

into thoſe Inſects call'd Mites, 'tis both in a Philoſophical ſenſe *corrupted*, and in the eſtimate of the generality of Men grown *Putrid*. But becauſe it very ſeldome happens, that a Body by generation acquires no other Qualities, then juſt thoſe that are abſolutely *neceſſary* to make it belong to the *Species* that denominates it, therefore in moſt Bodies there are diverſe other Qualities that may *be* there, or may be *miſsing*, without eſſentially changing the Subject: as Water may be clear or muddy, odorous or ſtinking, and ſtill remain Water; and Butter may be white or yellow, ſweet or rancid, conſiſtent or melted, and ſtill be call'd Butter. Now therefore whenſoever a parcel of Matter does *acquire* or *looſe* a Quality, that is not *Eſſential* to it, that Acquiſition or Loſſe is diſtinctly call'd *Alteration*, (or by ſome, *Mutation*:) the acquiſt onely of the Qualities that are abſolutely *neceſſary* to conſtitute its Eſſential and Specificall difference, or the Loſſe of any of *thoſe* Qualities, being ſuch a Change as muſt not be call'd meer *Alteration*, but have the particular name of Generation or Corruption; both which according to this doctrine appear to be but ſeverall *Kinds of Alteration*, taken in a large ſenſe, though they are diſtinguiſh'd from it in a more ſtrict and limited acception of that terme.

And here we have a fair occaſion to take notice of the fruitfulneſſe and extent of our Mechanicall

Mechanical Hypotheſis: For ſince according to our Doctrine, the World we live in is not a Moveleſſe or Indigeſted maſſe of Matter, but an Ἀυτόματον, or *Self-moving Engine*, wherein the greateſt part of the common Matter of all Bodies is alwaies (though not ſtill the ſame parts of it) in Motion, and wherein Bodies are ſo cloſe ſet by one another, that (unleſſe in ſome very few and extraordinary and as it were Preternatural caſes) they have either no Vacuities betwixt them, or onely here and there interpos'd and very ſmall ones. And ſince, according to us, the various *manner* of the *Coalition* of ſeveral *Corpuſcles* into one viſible *Body* is enough to give them a peculiar Texture, and thereby fit them to exhibit divers ſenſible Qualities, and to become a Body, ſometimes of one Denomination, and ſometimes of another; it will very naturally follow, that from the various Occurſions of thoſe innumerable ſwarms of little Bodies, that are mov'd to and fro in the World, there will be many fitted to ſtick to one another, and ſo compoſe Concretions, and many (though not in the ſelfe ſame place) diſjoyn'd from one another, and agitated apart; and multitudes alſo that will be driven to aſſociate themſelves, now with one Body, and preſently with another. And if we alſo conſider on the one ſide, that the Sizes of the ſmall Particles of Matter may be very *various*, their Figures almoſt *innumerable*, and that if a parcell of Matter

Matter do but happen to ſtick to one Body, it may chance to give it a new quality, and if it adhere to another, or hit againſt ſome of its parts, it may conſtitute a Body of another Kind; or if a parcel of Matter be knockt off from another, it may barely by that leave it, and become it ſelf of another Nature then before. If, I ſay, we conſider theſe things on the one ſide; and on the other ſide, that (to uſe *Lucretius* his compariſon) all that innumerable multitude of Words, that are contain'd in all the Languages of the World, are made of the various combinations of ſome of the 24 Letters of the Alphabet; 'twill not be hard to conceive, that there may be an incomprehenſible variety of Aſſociations and Textures of the Minute parts of Bodies, and conſequently a vaſt multitude of Portions of Matter endow'd with ſtore enough of differing Qualities, to deſerve diſtinct Appellations; though for want of heedfulneſſe and fit words, men have not yet taken ſo much notice of their leſſe obvious Varieties, as to ſort them as they deſerve, and give them diſtinct and proper Names. So that though I would not ſay, that any thing can immediately be made of every thing, as a Gold Ring of a *VVedge* of Gold, or Oyl or Fire of Water; yet ſince Bodies, having but one common Matter, can be differenc'd but by Accidents, which ſeeme all of them to be the effects and conſequents of Locall Motion, I ſee not,

why

why it ſhould be abſurd to think, that (at leaſt among inanimate Bodies) by the intervention of ſome very ſmall *Addition* or *Subſtraction* of Matter, (which yet in moſt caſes will ſcarce be needed,) and of an orderly *Series of Alterations*, diſpoſing by degrees the Matter to be tranſmuted, almoſt of any thing may at length be made any thing: as, though out of a *wedge* of Gold one cannot immediately make a *Ring*, yet by either Wyre-drawing that wedge by degrees, or by melting it, and caſting a little of it into a Mould, that thing may eaſily be effected. And ſo though Water cannot immediately be tranſmuted into Oyl, and much leſſe into Fire, yet if you nouriſh certain Plants with water alone, (as I have done,) till they have aſſimilated a great quantity of water into their own nature, you may, by committing this tranſmuted water (which you may diſtinguiſh and ſeparate from that part of the Vegetable you firſt put in) to Diſtillation in convenient Glaſſes, obtain, beſides other things, a true Oyl, and a black combuſtible Coal, (and conſequently Fire,) both of which may be ſo copious, as to leave no juſt cauſe to ſuſpect, that they could be any thing neer afforded by any little Spirituous parts, which may be preſum'd to have been communicated by that part of the Vegetable that is firſt put into the water, to that far greater part of it, which was committed to Diſtillation.

But,

But, *Pyrophilus*, I perceive the difficulty and fruitfulneſſe of my Subject have made me ſo much more prolix then I intended, that it will not now be amiſſe to contract the Summary of our *Hypotheſis*, and give you the main points of it with little or no illuſtration, and without particular proofs in a few words. We teach then (but without peremptorily aſſerting it,)

Firſt, that the Matter of all Natural Bodies is the ſame, namely a Subſtance extended and impenetrable.

2. That all bodies thus agreeing in the ſame common Matter, their diſtinction is to be taken from thoſe Accidents that do diverſify it.

3. That Motion, not belonging to the Eſſence of Matter, (which retains its whole nature when tis at reſt,) and not being originally producible by other Accidents, as they are from It, may be look'd upon as the firſt and chief *Mood* or Affection of Matter.

4. That Motion, variouſly determin'd, doth naturally divide the Matter it belongs to into actual fragments or parts, and this Diviſion obvious Experience (and more eminently, Chymical Operations) manifeſt to have been made into parts exceedingly *minute*, and very often too minute to be ſingly perceivable by our Senſes.

5. Whence it muſt neceſſarily follow, that each of theſe Minute parts or *minima Naturalia* (as well as every particular body, made up by the coalition of any number of them,) muſt have its

its determinate *Bigneſſe* or *Size*, and its own *Shape*. And theſe three, namely *Bulk*, *Figure*, and either *Motion* or *Reſt*, (there being no Mean between theſe two) are the three *Primary* and moſt *Catholick Moods* or Affections of the *inſenſible* parts of Matter, conſider'd *each* of them *apart*.

6, That when *diverſe* of them are conſider'd *together*, there will neceſſarily follow here below both a certain *Poſition* or *Poſture* in reference to the Horizon (as erected, inclining, or level) of each of them, and a certain *Order* or placing before, or behind, or beſides one another; (as when in a company of Souldiers one ſtands *upright*, the other *ſtoops*, the other *lies along* upon the ground, they have various *Poſtures*; and their being plac'd *beſides* one another in ranks, and *behind* one another in Files are varieties of their *Order*: and when many of theſe ſmall parts are brought to convene into one body from their *primary Affections*, and their Diſpoſition or *Contrivance* as to *Poſture* and *Order*, there reſults That, which by one comprehenſive name we call the *Texture* of that body. And indeed theſe ſeveral kinds of *Location* (to borrow a Scholaſtical Terme,) attributed in this 6th number) to the minute particles of Bodies, are ſo neer of kinne, that they ſeem all of them referible to (that one event of their convening) *Scituation* or *Poſition*. And theſe are the Affections that belong to a Body, as it is conſider'd in it ſelf,

ſelf, without relation to *ſenſitive* Beings, or to other Natural bodies.

7. That yet there being men in the world, whoſe organs of Senſe are contriv'd in ſuch differing wayes, that one Senſory is fitted to receive impreſſions from ſome, and another from other ſorts of external Objects or Bodies without them, (whether theſe act as entire Bodies, or by *Emiſſion* of their Corpuſcles, or by *propagating* ſome motion to the Senſory,) the perceptions of theſe impreſſions are by men call'd by ſeveral names, as *Heat*, *Colour*, *Sound*, *Odour*; and are commonly imagin'd to proceed from certain diſtinct and peculiar Qualities in the external Object, which have ſome reſemblance to the Ideas, their action upon the Senſes excites in the Mind; though indeed all theſe ſenſible Qualities, and the reſt that are to be met with in the bodies without us, are but the effects or conſequents of the above mentioned *primary Affections* of Matter, whoſe operations are diverſify'd according to the nature of the Senſories or other Bodies they work upon.

8. That when a portion of Matter, either by the *acceſſion* or *receſſe* of Corpuſcles, or by the *tranſpoſition* of thoſe it conſiſted of before, or by any *two* or *all* of theſe waies, happens to obtain a *concurrence of all* thoſe Qualities, which Men commonly agree to be *neceſſary* and *ſufficient* to denominate the Body, which hath them,

them, either a *Metal*, or a *Stone*, or the like; and to rank it in any peculiar and determinate *ſpecies* of Bodies, then a Body of that denomination is ſaid to be *Generated*.

9. This *convention of Eſſential Accidents* being taken (not any of them apart, but all) *together* for the ſpecifical Difference that *conſtitutes* the Body, and *diſcriminates* it from all other ſorts of Bodies, is by one name, becauſe conſider'd as one *collective* thing, call'd its *Forme*, (as Beauty, which is made up of Symmetry of parts, and agreeableneſſe of colours,) which is conſequently but a certain *Character*, (as I ſometimes call it,) or a *peculiar ſtate of Matter*, or, if I may ſo name it, an *Eſſential Modification*: a *Modification*, becauſe tis indeed but a determinate *manner of Exiſtence* of the Matter, and yet an *Eſſential Modification*, becauſe that though the concurrent Qualities be but accidental to Matter, (which with others in ſtead of them would be Matter ſtill,) yet they are *eſſentially neceſſary* to the particular *Body*, which without thoſe Accidents would not be a Body of that denomination, as a *Metal* or a *Stone*, but of ſome other.

10. Now a Body being capable of many *other* Qualities, *beſides* thoſe, whoſe Convention is *neceſſary* to make up its Forme; the *acquiſition* or *loſs* of any ſuch Quality is by Naturaliſts, in the more ſtrict ſenſe of that Terme, nam'd *Alteration*: as when oyl comes to be frozen,

or

or to change colour, or to grow rancid; but if all or any of the Qualities, that are reputed *essential* to such a Body, come to be *lost* or *destroy'd*, that notable change is call'd *Corruption*; as when Oyl being boyl'd takes fire, the Oyl is not said to be *alter'd* in the former sense, but *corrupted* or *destroy'd*, and the emergent fire *generated*; and when it so happens that the body is *slowly corrupted*, and thereby also acquires *Qualities offensive to our Senses*, especially of *Smell* and *Tast*, (as when Flesh or Fruit grows rotten,) that kind of *Corruption* is by a more particular name call'd *Putrefaction*. But neither in this, nor in any other kind of Corruption is there any thing *substantial* destroy'd, (no such thing having been produc'd in Generation, and Matter it self being on all hands acknowledged *incorruptible*,) but onely that *special connexion of the Parts*, or *manner of their Coëxistence*, upon whose account the Matter (whilst it was in its former state) was, and was call'd a Stone, or a Metal, or did belong to any other determinate *species* of Bodies.

OF THE ORIGINE OF FORMS.

THe Origine of Forms, *Pyrophilus*, as it is thought the *nobleſt*, ſo, if I miſtake not, it hath been found one of the moſt *perplex'd* enquiries that belong to Natural Philoſophy: and, I confeſſe, it is one of the things that has invited me to look about for ſome more ſatisfactory account, then the Schools uſually give of this matter, that I have obſerv'd, that the wiſeſt, that have buſied themſelves in explicating Forms according to the Peripatetick notions of them, have either knowingly confeſs'd themſelves unable to explain them, or unwittingly prov'd themſelves to be ſo, by giving but unſatisfactory explications of them.

It will not (I preſume) be expected, that I, who now write but *Notes*, ſhould enumerate much leſſe examine all the various Opinions touching the origine and nature of Forms; it being enough for our purpoſe, if having already intimated in our *Hypotheſis*, what, according to

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Formarum cognitio eſt rudis, confuſa, nec niſi per ἀφαιρέσεις; neque verum eſt, formæ ſubſtantialis ſpeciem recipi in intellectum, non enim in ſenſu uſquam fuit. I. C. Scalig.

Formæ ſubſtantiales ſunt incognitæ nobis, quia inſenſiles: ideo per qualitates, quæ ſunt principia immediata Tranſmutationis, exprimuntur. Aquinas ad 1. de generat. & corrupt.

In hac humanæ mentis caligine æquè forma Ignis *ac Magnetis nobis ignota eſt.* Sennertus.

that, may be thought of this Subject; we now briefly consider the general opinion of our modern *Aristotelians* and the Schools concerning it: I say, the *modern* Aristotelians, because divers of the *Antient*, especially *Greek* Commentators of *Aristotle*, seem to have understood their Master's doctrine of Forms much otherwise, and lesse incongruously, then his Latin followers, the Schoolmen and others, have since done. Nor do I expresly mention *Aristotle* himself among the Champions of substantial Forms, because though he seem in a place or two expresly enough to reckon Formes among *Substances*, yet elsewhere the Examples he employes to set forth the *Forms* of Natural things by, being taken from the *Figures* of artificial things, (as of a Statue, &c.) which are confessedly but *Accidents*, and making very little use, if any, of substantial Forms to explain the *Phænomena* of Nature, he seems to me upon the whole matter either to have been irresolv'd, whether there were any such Substances or no, or to speak ambiguously and obscurely enough of them, to make it questionable what his opinions of them were.

But the summe of the controversie betwixt Us and the Schools is this, whether or no the Forms of Natural things (the Souls of men alwaies excepted) be in generation *educed*, as they speak, *out of the power of the Matter*, and whether these Forms be true *substantial Entities*, distinct from

from the other ſubſtantial Principle of natural Bodies, namely Matter.

The Reaſons that move me to embrace the Negative are principally theſe three. *Firſt*, that I ſee no neceſſity of admitting in Natural things any ſuch ſubſtantial Forms; Matter and the accidents of Matter being ſufficient to explicate as much of the *Phænomena* of Nature, as we either do or are like to underſtand. *The next*, that I ſee not what uſe this puzling doctrine of ſubſtantial Forms is of in Natural Philoſophy; the acute *Scaliger*, and thoſe that have moſt buſied themſelves in the indagation of them, having freely acknowledg'd, (as the more Candid of the Peripateticks generally do,) that the true knowledge of Forms is too difficult and abſtruſe to be attain'd by them. And how like it is, that particular *Phænomena* will be explain'd by a Principle whoſe nature is confeſſedly ignor'd, I leave you to judge: but becauſe to theſe conſiderations I often have had, and ſhall have here and there occaſion, to ſay ſomething in the body of theſe Notes, I ſhall at preſent inſiſt upon the *third*, which is, that I cannot conceive, neither how Forms can be generated, as the Peripateticks would have it, nor how the things they aſcribe to them are conſiſtent with the principles of true Philoſophy, or even with what themſelves otherwiſe teach.

The manner how Forms are educed out of the power of the Matter, according to that part

of the doctrine of Formes, wherein the Schools generally enough agree, is a thing ſo inexplicable, that I wonder not it hath put acute men upon ſeveral *Hypotheſes* to make it out. And indeed the number of theſe is of late grown too great to be fit to be here recited, eſpecially ſince I find them all ſo very unſatisfactory, that I cannot but think the acute Sticklers for any of them are rather driven to embrace it by the palpable inconveniences of the wayes they reject, then by any thing they find to ſatiſfie them in that which they make choice of: and for my part I confeſſe, I find ſo much reaſon in what each party ſayes againſt the explications of the reſt, that I think they all confute well, and none does well eſtabliſh.

But my preſent way of writing forbidding me to inſiſt on many arguments againſt the Doctrine wherein they moſt agree, I ſhall onely urge that which I confeſſe chiefly ſticks with me, namely that I find it not *comprehenſible*.

I know the modern Schoolmen fly here to their wonted refuge of an obſcure Diſtinction, and tell us, that the power of Matter in reference to Forms is partly Eductive, as the Agent can make the Form out of it, and partly Receptive, whereby it can receive the Form ſo made; but ſince thoſe that ſay this will not allow that the Form of a generated Body was actually præexiſtent in its Matter, or indeed any where elſe,

elſe, tis hard to conceive how a Subſtance can be educ'd out of another Subſtance totally diſtinct in nature from it, without being, before ſuch Eduction, actually exiſtent in it. And as for the Receptive power of the Matter, *that* but fitting it to receive or lodge a Form, when brought to be united with it, how can it be intelligibly made out to contribute to the production of a new Subſtance of a quite differing nature from that matter, though it harbours it when produc'd? And tis plain, that the humane Body hath a receptive power in reference to the humane Soule, which yet themſelves confeſſe both to be a ſubſtantial Form, and not to be educ'd out of the power of Matter. Indeed if they would admit the Form of a natural Body to be but a more fine and ſubtle part of the Matter, as ſpirit of Wine is of wine, which upon its receſſe remains no longer Wine, but Flegm or Vinegar, then the eductive power of Matter might ſignifie ſomething; and ſo it might, if with us they would allow the Form to be but a Modification of the Matter; for then it would import but that the Matter may be ſo order'd or diſpoſ'd by fit Agents, as to conſtitute a Body of ſuch a ſort and denomination: and ſo (to reſume that Example) the Form of a Sphere may be ſaid to lurk potentially in a piece of Braſs, in as much as that Braſſe may by caſting, turning, or otherwiſe, be ſo figur'd as to become a Sphere. But *this* they will not admit, leaſt

they ſhould make Forms to be but Accidents, though it is for ought I know as little intelligible how what is educ'd out of any Matter, without being either præexiſtent, or being any part of the Matter, can be a true Subſtance, as how that Roundneſſe, that makes a piece of Braſſe become a Sphere, can be a new Subſtance in it. Nor can they admit the *other way* of educing a Form out of Matter, as Spirit is out of Wine, becauſe then not onely Matter will be corruptible againſt their grounds, but Matter and Form would not be two differing and ſubſtantial Principles, but one and the ſame, though diverſify'd by firmneſſe, groſſeneſs, &c. which are but accidental differences. I know they ſpeak much of the efficacy of the Agent upon the Matter in the generation of Natural Bodies, and tell us ſtrange things of his manner of working. But not to ſpend time in examining thoſe obſcure niceties, I anſwer in ſhort, That ſince the Agent, be he what he will, is but a Phyſical and finite Agent, and ſince what way ſoever he works, he can do nothing repugnant to the nature of things, the difficulty that ſticks with me will ſtill remain. For if the Form produc'd in generation be, as they would have it, a Subſtance, that was not before to be found any where out of that portion of Matter, wherewith it conſtitutes the generated Body; I ſay that either it muſt be produc'd by refining or ſubtiliating ſome parts

of

of the Matter into Form, or elſe it muſt be produc'd out of nothing, that is, created: (for I ſee no third way how a Subſtance can be produc'd *de novo.*) If they allow the firſt, then will the Form be indeed a Subſtance, but not, as they hold it is, diſtinct from Matter; ſince Matter, however ſubtiliated, is Matter ſtill, as the fineſt ſpirit of Wine is as truly a Body as was the Wine it ſelf that yielded it, or as is the groſſer Flegm from which it was extracted: beſides that, the Peripateticks teach, that the Form is not made of any thing of the Matter; nor indeed is it conceivable, how a Phyſical Agent can turn a Material into an Immaterial Subſtance, eſpecially Matter being, as they themſelves confeſſe, as well incorruptible as ingenerable. But if they will not allow, as indeed they do not, that the ſubſtantial Form is made of any thing that is material, they muſt give me leave to believe, that tis produc'd out of Nothing, till they ſhew me how a Subſtance can be produc'd otherwiſe, that exiſted no where before. And at this rate every natural Body of a ſpecial denomination, as Gold, Marble, Nitre, &c. muſt not be produc'd barely by generation, but partly by generation, and partly by creation. And ſince tis confeſs'd on all ſides, that no natural Agent can produce the leaſt Atome of Matter, tis ſtrange they ſhould in Generation allow every Phyſical Agent the power of producing a Form, which, according to them, is not onely a Sub-

ſtance, but a far nobler one then Matter, and thereby attribute to the meaneſt creatures that power of creating Subſtances, which the antient Naturaliſts thought too great to be aſcrib'd to God himſelf, and which indeed is too great to be aſcrib'd to any other then him; and therefore ſome Schoolmen and Philoſophers have deriv'd Formes iumediately from God; but this is not onely to deſert *Ariſtotle* and the Peripatetick Philoſophy they would ſeem to maintain, but to put Omnipotence upon working I know not how many thouſand miracles every hour, to perform that (I mean the generation of Bodies of new denominations) in a ſupernatural way, which ſeems the moſt familiar effect of Nature in her ordinary courſe.

And as the production of Forms out of the power of Matter is for theſe reaſons incomprehenſible to me, ſo thoſe things which the Peripateticks aſcribe to their ſubſtantial Forms are ſome of them ſuch, as, I confeſſe, I cannot reconcile my reaſon to: for they tell us poſitively that theſe Forms are Subſtances, and yet at the ſame time they teach, that they depend upon Matter both *in fieri* and *in eſſe*, as they ſpeak, ſo that out of the Matter that ſupports them, they cannot ſo much as exiſt, (whence they are uſually call'd Material Formes,) which is to make them Subſtances in name, and but Accidents in truth: for not to ask how (among Phyſical things) one Subſtance can be ſaid to depend upon

upon another *in fieri*, that is not made of any part of it, the very notion of a Subſtance is to be a ſelf-ſubſiſting Entity, or that which needs no other created Being to ſupport it, or to make it exiſt. Beſides that, there being but two ſorts of Subſtances, Material and Immaterial, a ſubſtantial Form muſt appertain to one of the two, and yet they aſcribe things to it, that make it very unfit to be referr'd to either. To all this I adde, that theſe imaginary Material Forms do almoſt as much trouble the Doctrine of Corruption, as that of Generation: for if a Form be a true Subſtance really diſtinct from Matter, it muſt, as I lately noted, be able to exiſt of it ſelf, without any other Subſtance to ſupport it; as thoſe I reaſon with confeſſe, that the Soul of Man ſurvives the Body, it did before Death informe: whereas they will have it, that in Corruption the Form is quite aboliſh'd, and utterly periſhes, as not being capable of exiſting, ſeparated from the Matter, whereunto it was united: ſo that here again, what they call a Subſtance they make indeed an Accident, and beſides contradict their own vulgar doctrine, that Natural things are upon their Corruption reſolv'd into the firſt Matter, ſince at this rate they ſhould ſay, that ſuch things are but partly reſolv'd into the firſt Matter, and partly either into nothing, or into Forms, which being as well immaterial as the Souls of Men, muſt, for ought appears, be alſo, like them, accounted immortal.

I ſhould now examine thoſe Arguments, that are wont to be imploy'd by the Schools to evince their ſubſtantial Forms, but, beſides that the nature and ſcope of my preſent Work injoynes me Brevity, I confeſſe that, one or two excepted, the Arguments I have found mention'd, as the chief, are rather Metaphyſical, or Logicall, then grounded upon the Principles and *Phænomena* of Nature, and reſpect rather words then things, and therefore I, who have neither inclination nor leaſure, to wrangle about terms, ſhall content my ſelf to propoſe, and very briefly anſwer two or three of thoſe that are thought the plauſibleſt.

Firſt then they thus argue, *Omne Compoſitum ſubſtantiale* (for it is hard to Engliſh well ſuch Uncouth Terms) *requirit materiam & formam ſubſtantialem, ex quibus componatur. Omne corpus naturale eſt compoſitum ſubſtantiale. Ergo* &c. In this Syllogiſme ſome do plauſibly enough deny the Conſequence, but for brevities ſake, I ſhall rather chooſe to deny the Minor, and deſire the Propoſers to prove it. For I know not any thing in Nature that is compoſ'd of Matter, and a Subſtance diſtinct from Matter, except Man, who alone is made up of an immaterial Form, and a humane Body; and if it be urg'd, that then other Bodies cannot be properly ſaid to be *Compoſita ſubſtantialia*, I ſhall, rather then wrangle with them, give them leave to find out ſome other name for other Natural things.

But

But then they argue in the next place, that, if there were no ſubſtantial Forms, all bodies would be but *Entia per accidens*, as they ſpeak, which is abſurd. To which I anſwer, that in the Notion, that divers Learned men have of an *Ens per Accidens*, namely, that 'tis That which conſiſts of thoſe things, *quæ non ordinantur ad unum*, it may be ſaid, That though we do not admit ſubſtantial Forms, yet we need not admit Natural Bodies to be *Entia per accidens*; becauſe in them the ſeveral things that concurre to conſtitute the Body, as Matter, Shape, Situation, and Motion, *ordinantur per ſe & intrinſicè* to conſtitute one Natural Body. But, if this Anſwer ſatiſfie not, I ſhall adde, that for my part, That which I am ſollicitous about, is what Nature hath made things to be in themſelves, not what a Logician or Metaphyſician will call them in the terms of his Art; it being much fitter in my judgment to alter words, that they may better fit the nature of things, then to affix a wrong nature to things, that they may be accommodated to forms of Words, that were probably deviſ'd, when the things themſelves were not known or well underſtood, if at all thought on.

Wherefore I ſhall but adde one Argument more of this ſort, and That is, that if there were no ſubſtantial Forms, neither could there be any ſubſtantial Definitions, but the Conſequent is abſurd, and therefore ſo is the Antecedent. To

which

which I reply, that ſince the Peripateticks themſelves confeſſe the Forms of Bodies to be of themſelves unknown, all that this argument ſeems to me to conclude, is but this, *That* if we do not admit ſomethings, that are not *in rerum natura*, we cannot build our Definitions upon them: nor indeed could we, if we ſhould admit ſubſtantial Forms, give ſubſtantial Definitions of Natural things, unleſſe we could alſo define Natural bodies by things that we know not; for ſuch * the ſubſtantial Forms are (as we have ſeen already) confeſſ'd to be, by the wiſeſt Peripateticks, who pretend not to give the ſubſtantial Definition of any Natural *Compoſitum*, except Man. But it may ſuffice Us to have, inſtead of *ſubſtantial*, *eſſential* Definitions of things; I mean ſuch as are taken from the Eſſential Differences of things, which conſtitute them in ſuch a ſort of Natural Bodies, and diſcriminate them from all thoſe of any other ſort.

Theſe three Arguments, *Pyrophilus*, for ſubſtantial Forms, You may poſſibly, as well as I, find variouſly propoſ'd, and perhaps with ſome light alterations multiply'd in the writings of the Peripateticks and Schoolmen; but all the arguments of this kind that I have met with, may, if I miſtake not, be ſufficiently ſolv'd by the anſwers we have given to theſe, or at leaſt

* *Nego tibi ullam eſſe formam nobis notam plenè & planè, noſtramq; ſcientiam eſſe umbram in Sole. Scalig.*

by

by the grounds upon which those Answers are built; those seemingly various Arguments agreeing in this, That *either* they respect rather words then things, *or* that they are grounded upon precarious Suppositions; *or* lastly that they urge that as an absurdity, which, whether it be one or not in those, that admit the Peripatetick Philosophy, to me, that doe as little acquiesce in many of their other Principles, as I do in their substantial Forms, doth not appear any Absurdity at all. And 'tis perhaps for fear that Arguments of this sort should not much prevaile with Naturalists, that some of the Modern assertors of the Forms we question, have thought it requisite to adde some more Physical Arguments, which (though I have not found them all in the same Writers, yet) being in all but few, I shall here briefly consider them.

First then among the Physical Arguments, that are brought to prove substantial Forms, I find that the most confidently insisted on, which is taken from the spontaneous return of heated Water to Coldness, which effects, say they, must necessarily be ascrib'd to the Action of the substantial Form, whose office it is to preserve the Body in its Natural state, and, when there is occasion, to reduce it thereunto: and the Argument indeed might be plausible, if we were sure, that heated Water would grow cold again (without the Avolation of any Parts more agitated

agitated then the reſt,) ſuppoſing it to be remov'd into ſome of the imaginary ſpaces beyond the World; but as the caſe is, I ſee no neceſſity of flying to a ſubſtantial Form, the Matter ſeeming to be eaſily explicable otherwiſe. The Water we heat is ſurrounded with our Air, or with ſome Veſſel, or other Body contiguous to the Air, and both the Air and the Water in theſe Climates are moſt commonly leſſe agitated, then the Juices in our hands, or other Organs of Touching, which makes us eſteem and call thoſe Fluids, cold. Now when the Water is expos'd to the fire, it is thereby put into a new Agitation, more vehement then that of the parts of our Senſory, which you will eaſily grant, if you conſider, that when the Heat is intenſe, it makes the Water boyl and ſmoak, and oftentimes run over the Veſſel; but when the Liquor is remov'd from the fire, this acquir'd Agitation muſt needs by degrees be loſt, *either* by the avolation of ſuch fiery Corpuſcles as the Epicureans imagine to be got into heated Water, *or* by the Water's communicating the Agitation of its Parts to the contiguous Air, or to the Veſſel that contains it, till it have loſt its ſurpluſage of Motion, *or* by the ingreſſe of thoſe frigorifick Atoms, wherewith (if any ſuch be to be granted) the Air in theſe Climates is wont to abound, and ſo be reduc'd into its former Temperature: which may as well be done without a ſubſtantial Form, as if a Ship ſwimming

ſlowly

ſlowly down a River, ſhould by a ſudden guſt of Wind, blowing the ſame way the Stream runs, be driven on much faſter then before, the Veſſel upon the ceaſing of the Wind may, without any ſuch internal principle, return after a while to its former ſlowneſſe of Motion: So that in this *Phænomenon*, we need not have recourſe to an internal principle, the Temperature of the external Air being ſufficient to give an account of it: And if Water be kept, (as is uſual in poor mens houſes that want Cellars,) in the upper Rooms of the houſe, in caſe the Climate be hot, the Water will, in ſpight of the Form, continue far leſſe cold, then, according to the Peripateticks, its nature requires, all the Summer long. And let me here repreſent to the Champions of Forms, that, according to their Doctrine, the Fluidity of Water, muſt at leaſt as much proceed from its Forme, as the Coldneſſe, and yet this does ſo much depend upon the Temperature of the Air, that in *Nova Zembla* vaſt quantities of Water are kept in the hard and ſolid Form of Ice all the year long by the ſharp Cold of the ambient Air, notwithſtanding all the pretended office and power of the ſubſtantial Form to keep it fluid, which it will never be reduc'd to be, unleſſe by ſuch a thawing Temperature of the Air, as would it ſelf, for ought appears, make it flow again, although there were no ſubſtantial Form *in rerum naturâ*.

There is another Argument much urg'd of late

late by ſome learned men, the ſubſtance where-of is this, that Matter being indifferent to one ſort of Accidents as well as to another, it is neceſſary there ſhould be a ſubſtantial Form to keep thoſe Accidents which are ſaid to conſtitute it, united to the Matter they belong to, and preſerve both them and the Body in their natural ſtate; for ſince tis confeſſ'd that Matter hath no appetite to theſe Accidents more then to any others, they demand, how without a ſubſtantial Form theſe Accidents can be contain'd and preſerv'd? To this I might repreſent, that I am not ſo well ſatisfied with the notion wont to be taken for granted, not onely by the vulgar, but by Philoſophers, of the natural ſtate of Bodies; as if it were undeniable, that every natural Body (for as to ſome I ſhall not *now* queſtion it) has a certain ſtate, wherein Nature endeavours to preſerve it, and out of which it cannot be put, but by being put into a preternatural ſtate. For the World being once conſtituted by the great Anthor of things as it now is, I look upon the *Phænomena* of Nature to be cauſ'd by the Local motion of one part of Matter hitting againſt another, and am not ſo fully convinc'd, that there is ſuch a thing as Natures deſigning to keep ſuch a parcel of Matter in ſuch a ſtate, that is cloth'd with juſt ſuch Accidents, rather then with any other. But I look upon many Bodies, eſpecially fluid ones, as frequently changing their ſtate, according as they happen to be more

or

or leſſe agitated, or otherwiſe wrought upon by the Sun, and other conſiderable agents in Nature. As the Air, Water, and other fluids, if the temperature, as to Cold or Heat and Rarefaction or Condenſation, which they are in at the beginning of the Spring here at *London*, be pitcht upon as their natural ſtate, then not onely in the torrid and frozen Zones they muſt have other and very differing natural ſtates, but here it ſelf they will almoſt all the Summer and all the Winter (as our Weather-glaſſes inform us) be in a varying preternatural ſtate, becauſe they will be in thoſe ſeaſons either more hot and rarify'd, or more cold and condenſ'd, then in the beginning of the Spring. And in more ſtable and conſtant bodies I take in many caſes the natural ſtate to be but either *the moſt uſual ſtate*, or *that, wherein that which produces a notable change in them finds them*. As when a ſlender piece of Silver, that is moſt commonly flexible, and will ſtand bent every way, comes to be well hammer'd, I count that flexibility to be the natural ſtate of that Metal, becauſe moſt commonly Silver is found to be flexible, and becauſe it was ſo before it was hammer'd; but the ſpringineſſe it acquires by hammering is a ſtate, which is properly no more unnatural to the Silver then the other, and would continue with the metal as long as It, if both pieces of Silver, the one flexible, the other ſpringy, were let alone and kept from outward violence:

And as the Silver to be depriv'd of its flexibleneſſe needed the violent motion of the Hammer, ſo to deprive it of its ſpring it needs the violent agitation of a nealing fire. Theſe things and much more I might here repreſent, but to come cloſe to the objection, I anſwer, that the Accidents ſpoken of are introduced into the Matter by the Agents or efficient cauſes, whatever they be, that produce in it what (in the ſenſe formerly explain'd) we call an *eſſential* (though not a *ſubſtantial*) Form. And theſe Accidents being once thus introduc'd into the Matter, we need not ſeek for a new ſubſtantial Principle to preſerve them there, ſince by the general law or common courſe of nature, the Matter qualify'd by them muſt continue in the ſtate ſuch Accidents have put it into, till by ſome Agent or other it be forcibly put out of it, and ſo diveſted of thoſe accidents; as in the formerly mention'd example, borrow'd from *Ariſtotle*, of a Brazen Sphere, when once the motion of tools, impell'd and guided by the Artificer, have turn'd a piece of Braſſe into a Sphere, there needs no new ſubſtance to preſerve that round figure, ſince the Braſſe muſt retain it till it be deſtroy'd by the Artificer himſelf, or ſome other agent able to overcome the reſiſtance of the Matter, to be put into another figure. And on this occaſion let me confirme this *ad hominem*, by repreſenting, that there is not an inconſiderable party among the Peripateticks themſelves, who maintain,

that

that in the Elements the first Qualities (as they call them) are instead of Forms, and that the Fire (for instance) hath no other Form then heat and dryneſſe, and the Water then coldneſs and moiſture. Now if theſe Bodies, that are the vaſteſt and the moſt important of the ſublunary world, conſiſt but of the univerſal Matter and the few Accidents, and if in theſe there needs no ſubſtantial Form to keep the qualities of the Matter united to it, and conjoyn'd among themſelves, and preſerve them in that ſtate as long as the law of Nature requires, though beſides the four Qualities that are called *Firſt*, the Elements have divers others, as gravity and levity, firmneſs and fluidity, opacouſneſs and tranſparency, &c. why ſhould the favourers of this opinion deny, that in other Bodies beſides the Elements qualities may be preſerv'd and kept united to the Matter they belong to, without the band or ſupport of a ſubſtantial Form? And as, when there is no competent deſtructive cauſe, the Accidents of a Body will by the law of Nature remain ſuch as they were; ſo if there be, it cannot with reaſon be pretended, that the ſubſtantial Form is able to preſerve all thoſe Accidents of a Body that are ſaid to flow from it, and to be as it were under its care and tuition; for if, for inſtance, you expoſe a Sphere or bullet of Lead to a ſtrong fire, it will quickly looſe (not to mention its figure) both its coldneſs, its conſiſtence, its malleableneſſe, its colour,

(for twill appear of the colour of fire,) its flexibility, and ſome other qualities, and all this in ſpight of the imaginary ſubſtantial Form, which, according to the Peripatetical principles, in this caſe muſt ſtill remain in it without being able to help it. And though upon the taking the Lead from off the fire, it is wont to be reduc'd to moſt of its former Qualities, (for it will not of its ſelf recover its Sphericity,) yet That may well be aſcrib'd partly to its peculiar Texture, and partly to the coldneſſe of the ambient Air, according to what we lately diſcourſ'd touching heated and refrigerated water, which temperature of the Air is an extrinſecal thing to the Lead, and indeed it is but accidental, that the Lead upon refrigeration regains its former qualities; for in caſe the Lead have been expoſ'd long enough to a ſufficiently intenſe fire, it will (as we have purpoſely try'd) be turn'd into Glaſſe, and looſe its colour, its opacity, its malleableneſſe, and (former degree of) flexibleneſs, and acquire a reddiſhneſſe, a degree of tranſparency, a brittleneſſe, and ſome other qualities that it had not before: and let the ſuppoſed ſubſtantial Form do what it can, even when the Veſſel is remov'd from the fire, to reduce or reſtore the Body to its Natural ſtate and accidents, yet the former qualities will remain loſt, as long as theſe preternatural ones introduc'd by the fire continue in the Matter; and neither the one will be reſtor'd, nor the other deſtroy'd, till

ſome

ſome ſufficiently powerful extrinſick Agent effect the change. And on the other ſide I conſider, that the Fruit, when ſever'd from the Tree it grew on, is confeſſ'd to be no longer animated (at leaſt the Kernels or Seeds excepted) by the Vegerative Soul or ſubſtantial Form of the Plant; yet in an Orange or Lemmon (for inſtance) pluckt from the Tree, we ſee that the ſame Colour, the ſame Odour, the ſame Taſt, the ſame Figure, the ſame Conſiſtence, and for ought we know, the ſame other qualities, whether ſenſible or even occult, as are its Antidotal and Antiſcorbutical virtues, that muſt before be ſaid to have flow'd from the Soul of the Tree, will continue many months, perhaps ſome years, after the fruit has ceaſ'd to have any commerce with the tree, (nay though the tree, whereon it grew, be perhaps in the mean time hewn down or burnt, and though conſequently its Vegetative Soul or Form be deſtroy'd,) as when it grew thereon, and made up one plant with it. And we find, that Tamarinds, Rhubarb, Senna, and many other Simples will for divers years, after they have been depriv'd of their former Vegetative ſoul, retain their Purgative and other ſpecifick properties.

I find it likewiſe urg'd, that there can be no reaſon, why whiteneſſe ſhould be ſeparable from a Wall, and not from Snow or Milk; unleſs we have recourſe to ſubſtantial Forms. But in caſe men have agreed to call a thing by ſuch a

name, becauſe it has ſuch a particular quality that differences it from others, we need go no farther to find a reaſon, why one Quality is eſſential to one thing, and not to another. As in our former example of a braſſe Sphere, the Figure is that for which we give it that name, and therefore, though you may alter the figure of the Matter, yet by that very alteration the Body periſhes in the capacity of a Sphere, whereas its coldneſſe may be exchang'd for heat, without the making it the leſſe a Sphere, becauſe tis not for any ſuch quality, but for Roundneſſe, that a Body is ſaid to be a Sphere. And ſo Firmneſſe is an inſeparable Quality of Ice, though this or that particular Figure be not, becauſe that tis for want of fluidity that any thing, that was immediately before a liquor, is called Ice; and congruouſly hereunto, though whiteneſſe were inſeparable from Snow and Milk, yet that would not neceſſarily infer, that there muſt be a ſubſtantial Form to make it ſo: for the firmneſſe of the Corpuſcles that compoſe Snow is as inſeparable from it as the whiteneſs; & yet it is not pretended to be the effect of the ſubſtantial Form of the water, but of the exceſſe of the coldneſſe of the Air, which (to uſe vulgar, though perhaps unaccurate expreſſions) puts the water out of its natural ſtate of fluidity, and into a preternatural one of firmneſs and brittleneſs. And the reaſon why Snow ſeldome looſes its whiteneſs but with its

nature,

nature ſeems to be, that its component Particles are ſo diſpoſ'd, that the ſame heat of the ambient Air that is fit to turn it into a tranſparent Body is alſo fit to make it a fluid one, which when it is become, we no longer call it Snow but Water; ſo that the water looſes its whiteneſſe, though the ſnow do not. But if there be a cauſe proper to make a convenient alteration of Texture in the ſnow, without melting or reſolving it into water, it may then exchange its whiteneſſe for yellowneſſe, without looſing its right to be call'd Snow; as I remember I have read in an emient Writer, that *de facto* in the Northern regions towards the Pole, thoſe parcels of ſnow, that have lain very long on the ground, degenerated in time into a yellowiſh colour, very differing from that pure whiteneſſe to be obſerv'd in the neighbouring Snow lately fallen.

But there yet remaines an argument for ſubſtantial Forms, which though (perhaps becauſe Phyſical) wont to be overlook'd or ſlightly anſwer'd by their oppoſers, will for the ſame reaſon deſerve to be taken notice of here; and it is, that there ſeems to be a neceſſity of admitting ſubſtantial Forms in Bodies, that from thence we may derive all the various changes to which they are ſubject, and the differing effects they produce, the preſervation and reſtitution of the ſtate requiſite to each particular Body, as alſo the keeping of its ſeveral parts united

into one *Totum*. To the answering of this argument so many things will be found applicable both in the past and subsequent parts of these Notes, that I shall at present but point the chief particulars, on which the Solution is grounded.

I consider then first, that many and great alterations may happen to Bodies, which seem manifestly to proceed from their peculiar Texture, and the action of outward Agents upon them, and of which it cannot be shewn, that they who would happen otherwise, though there were no substantial Forms *in rerum natura*: as we see that Tallow (for instance) being melted by the fire looses its coldness, firmness, and its whiteness, and acquires heat, fluidity, and some transparency, all which being suffer'd to cool, it presently exchanges for the three first nam'd Qualities. And yet diverse of these changes are plainly enough the effects partly of the fire, partly of the ambient Air, and not of I know not what substantial Form: and it is both evident and remarkable, what great variety of changes in Qualities, and productions of new ones, the fire (that is, a body consisting of insensible parts that are variously and vehemently mov'd) doth effect by its heat, that is, *by a modify'd Local motion*. I consider further, that various operations of a Body may be deriv'd from the peculiar Texture of the whole, and the mechanical affections of the particular corpuscles

or

or other parts that compoſe it, as we have often occaſion to declare here and there in this Treatiſe; and particularly by an Inſtance, ere long to be further inſiſted on, namely, that though Vitriol, made of Iron with a Corroſive liquor, be but a factitious Body, made by a convenient appoſition of the ſmall parts of the ſaline Menſtruum to thoſe of the Metal, yet this Vitriol will do moſt, if not all, of the ſame things, that Vitriol made by Nature in the bowels of the Earth, and digg'd out thence, will perform; and each of theſe Bodies may be endow'd with variety of differing Qualities, which I ſee not, why they muſt flow in the native Vitriol from a ſubſtantial Forme, ſince in the factitious Vitriol the ſame Qualities belong to a Forme, that does plainly emerge from the coalition of Metalline and Saline Corpuſcles, aſſociated together and diſpoſ'd of after a certain manner.

And laſtly, as to what is very confidently, as well as plauſibly, pretended, That a ſubſtantial Form is requiſite to keep the parts of a Body united, without which it would not be one Body; I anſwer, That the contrivance of conveniently figur'd parts, and in ſome caſes their juxta-poſition, may without the aſſiſtance of a ſubſtantial Form be ſufficient for this matter; for not to repeat what I juſt now mention'd concerning Vitriol made by Art, whoſe Parts are as well united and kept together, as thoſe of the Native

Native Vitriol, I obſerve, that a Pear grafted upon a Thorn, or a Plum inoculated upon an Apricock, will bear good fruit, and grow up with the Stock, as though they both made but one Tree, and were animated but by the ſame common Form; whereas indeed both the Stock and the inoculated or grafted Plant have each of them its own Form, as may appear by the differing leaves, and fruits, and ſeeds they bear: And that which makes to our preſent purpoſe is, that even Vegetation and the diſtribution of Aliments are in ſuch caſes well made, though the nouriſh'd parts of the Total Plant, if I may ſo call it, have not one common Soul or Form; which is yet more remarkable in the Miſſletoes, that I have ſeen growing upon old Hazletrees, Crab-trees, Apple-trees, and other plants, in which the Miſſletoe often differs very widely from that kind of Plant on which it growes and proſpers. And for the durableneſſe of the Union betwixt Bodies, that a ſubſtantial Form is not requiſite to procure it, I have been induc'd to think by conſidering, that Silver and Gold, being barely mingl'd by Infuſion, will have their minute parts more cloſely united, then thoſe of any Plant or Animal that we know of. And there is ſcarce any Natural Body, wherein the Forme makes ſo ſtrict, durable, and indiſſoluble an Union of the parts it conſiſts of, as that, which in that Factitious Concrete we call Glaſs ariſes from the bare commiſtion of the Corpuſcles

cles of Sand with thoſe Saline ones, wherewith they are colliquated by the violence of the fire: and the like may be ſaid of the Union of the proper Accidents of Glaſſe with the Matter of it, and betwixt one another.

To draw towards a Concluſion, I know 'tis alledg'd as a main Conſideration on the behalf of ſubſtantial Forms, that theſe being in Natural Bodies the true principles of their Properties and conſequently of their Operations, their Natural Philoſophy muſt needs be very imperfect and defective, who will not take in ſuch Forms: but for my part I confeſſe, that this very conſideration does rather indiſpoſe then incline me to admit them. For if indeed there were in every Natural Body ſuch a thing as a ſubſtantial Forme, from which all its Properties and Qualities immediately flow, ſince we ſee that the Actions of Bodies upon one another are for the moſt part (if not all) immediately perform'd by their Qualities or Accidents, it would ſcarce be poſſible to explicate very many of the explicable *Phænomena* of Nature, without having recourſe to Them; and it would be ſtrange, if many of the abſtruſer *Phænomena* were not explicable by them onely. Whereas indeed almoſt all the rational Accounts to be met with of difficult *Phænomena*, are given by ſuch as either do not *acknowledge*, or at leaſt do not *take notice* of ſubſtantial Forms. And 'tis evident by the clear Solutions (untouch'd by many vulgar Philoſophers,)

losophers,) we meet with of many *Phænomena* in the Staticks, and other parts of the Mechanicks, and especially in the Hydrostaticks, and Pneumaticks, how clearly many *Phænomena* may be solv'd, without imploying a substantial Form. And on the other side, I do not remember, that either *Aristotle* himself (who perhaps scarce ever attempted it,) or any of his Followers has given a solid and intelligible solution of any one *Phænomenon* of Nature by the help of substantial Forms; which you need not think it strange I should say, since, the greatest Patrons of Forms acknowledging their Nature to be * unknown to Us, to explain any effect by a substantial Form, must be to declare (as they speak) *ignotum per ignotius*, or at least *per æquè ignotum*. And indeed to explicate a *Phænomenon*, being to deduce it from something else in Nature more known to Us, then the thing to be explain'd by It, how can the imploying of Incomprehensible (or at least Uncomprehended) substantial Forms help Us to explain intelligibly This or That particular *Phænomenon*? For to say, that such an Effect proceeds not from this or that Quality of the Agent, but from its substantial Form, is to take an easie way to resolve all difficulties in general, without rightly resolving any one in particular; and would make a

* *Nomina tu lapidis, qui quotidie tuis oculis observatur, formam, & Phyllida solus habeto. Scal. contra Card.*

rare

rare Philoſophy, if it were not far more eaſie then ſatisfactory: for if it be demanded, why Jet attracts Straws, Rhubarb purges Choler, Snow dazles the Eyes rather then Graſſe, *&c.* to ſay, that theſe and the like Effects are perform'd by the ſubſtantial Forms of the reſpective Bodies is at beſt but to tell me, what is the Agent, not how the Effect is wrought; and ſeems to be but ſuch a kind of general way of anſwering, as leaves the curious Enquirer as much to ſeek for the *cauſes* and *manner* of particular Things, as Men commonly are for the particular cauſes of the ſeveral ſtrange Things perform'd by Witchcraft, though they be told, that 'tis ſome Divel that does them all. Wherefore I do not think, but that Natural Philoſophy, without being for That the more Defective, may well enough ſpare the Doctrine of Subſtantial Forms as an uſeleſſe Theory; not that Men are arriv'd to be able to explicate all the *Phænomena* of Nature without them, but becauſe, whatever we cannot explicate without them, we cannot neither intelligibly explicate *by* them.

And thus, *Pyrophilus*, I have offer'd You ſome of thoſe many things, that indiſpoſ'd me to acquieſce in the receiv'd Doctrine of Subſtantial Forms; but in caſe any more piercing Enquirer ſhall perſwade himſelf, that he underſtands it throughly, and can explicate it clearly, I ſhall congratulate him for ſuch happy Intellectuals,

and

and be very ready to be inform'd by him. But ſince what the Schools are wont to teach of the Origine and Attributes of ſubſtantial Forms, is that, which, I confeſſe, I cannot yet comprehend, and ſince I have ſome of the eminenteſt Perſons among the Modern Philoſophers to joine with me, though perhaps not for the ſame Conſiderations, in the like confeſſion, that 'tis not neceſſary the Reaſon of my not finding this Doctrine conceivable muſt be rather a Defectiveneſſe in my Underſtanding, then the unconceivable nature of the thing it ſelf: I, who love not (in matters purely Philoſophical) to acquieſce in what I do not underſtand, nor to go about to explicate things to others, by what appears to me it ſelf inexplicable, ſhall, I hope, be excuſ'd, if, leaving thoſe that contend for them the liberty of making what uſe they can of ſubſtantial Forms, I do, till I be better ſatisfied, decline imploying them my ſelf, and endeavour to ſolve thoſe *Phænomena*, I attempt to give an account of, without them, as not ſcrupling to confeſſe, that thoſe that I cannot explicate, at leaſt in a general way, by intelligible principles, I am not yet arriv'd to the diſtinct and particular knowledg of.

Now for our Doctrine touching the Origine of Forms, it will not be difficult to collect it from what we formerly diſcourſ'd about Qualities and Forms together: for the Forme of a Natural Body, being according to us, but an Eſſential

ſential Modification, and as it were the *Stamp* of its Matter, or ſuch a convention of the Bigneſſe, Shape, Motion (or Reſt,) Scituation and Contexture, (together with the thence reſulting Qualities) of the ſmall parts that compoſe the Body, as is neceſſary to conſtitute and denominate ſuch a particular Body, and all theſe Accidents being producible in Matter by Local Motion, 'tis agreeable to our *Hypotheſis* to ſay, That the firſt and Univerſal, though not immediate cauſe of Forms is none other but God, who *put Matter into Motion*, (which belongs not to its Eſſence,) and *Eſtabliſh'd the Lawes of Motion* amongſt Bodies, and alſo, according to my Opinion, *guided it in divers caſes at the beginning of Things*; and that, among Second Cauſes, the Grand Efficient of Forms is *Local Motion*, which by variouſly dividing, ſequeſtring, tranſpoſing, and ſo connecting the parts of Matter, produces in them thoſe Accidents and Qualities, upon whoſe account the portion of Matter they diverſifie comes to belong to this or that determinate *ſpecies* of Natural Bodies, which yet is not ſo to be underſtood, as if *Motion* were only an Efficient cauſe in the Generation of Bodies, but very often (as in water, fire, *&c.*) 'tis alſo one of the chiefe *Accidents*, that concurre to make up the Form.

But in this laſt Summary Account of the Origine of Forms, I think my ſelf oblig'd to declare to you a little more diſtinctly, what I juſt now

now intimated to be my own opinion. And this I shall do by advertising you, that though I agree with our *Epicureans*, in thinking it probable, that the World is made up of an innumerable multitude of singly insensible Corpuscles, endow'd with their own Sizes, Shapes, and Motions; and though I agree with the *Cartesians*, in believing (as I find that **Anaxagoras* did of old) that Matter hath not its motion from its self, but originally from God; yet in this I differ both from *Epicurus* and *Des Cartes*, that whereas the former of them plainly denies that the World was made by any Deity, (for Deities he own'd,) and the latter of them, for ought I can find in his Writings or those of some of his eminentest Disciples, thought, that God, having once put Matter into motion, and establish'd the laws of that Motion, needed not more particularly interpose for the production of things Corporeal, nor even of Plants or Animals, which according to him are but Engines: I do not at all believe, that either these *Cartesian laws of Motion*, or the *Epicurean casual concourse* of Atoms could bring meer Matter into so orderly and well contriv'd a Fabrick as this World; and therefore I think that the wise Author of Nature did not one-

* *Aristotle* speaking of *Anaxagoras* in the first Ch. of the last book of his Physicks hath this passage: *dicit* (*Anaxagoras*) *cùm omnia simul essent, atque* quiescerent *tempore infinito, Mentem* movisse *ac* segregasse.

ly

ly *put Matter into motion*, but when he resolv'd to make the World, did so regulate and *guide the motions* of the small parts of the Universal Matter, as to reduce the greater Systems of them into the order they were to continue in; and did more particularly contrive some portions of that Matter into Seminal Rudiments or Principles, lodg'd in convenient Receptacles, (and as it were Wombs,) and others into the bodies of Plants and Animals: one main part of whose contrivance did, as I apprehend, consist in this, that some of their organs were so fram'd, that, supposing the fabrick of the greater Bodies of the Universe, and the Laws he had establish'd in Nature, some juicy and spirituous parts of these living creatures must be fit to be turn'd into prolifick Seeds, whereby they may have a power, by generating their like, to propagate their *Species*. So that according to my apprehension it was *at the beginning* necessary, that an intelligent and wise Agent should contrive the Universal Matter into the World, (and especially some portions of it into Seminal organs and principles,) and settle the laws, according to which the motions and actions of its parts upon one another should be regulated: without which interposition of the world's Architect, however *moving Matter* may with some *probability* (for I see not in the Notion any certainty) be conceiv'd to be able after numberless occursions of its insensible parts

to cast it self into such grand conventions and convolutions as the Cartesians call *Vortices*, and as (I remember) * *Epicurus* speaks of under the name of προσκρίσεις, καὶ δινήσεις; yet I think it utterly improbable that *brute* and *unguided*, though *moving*, Matter, should ever convene into such admirable structures, as the bodies of perfect Animals. But the world being once fram'd and the course of Nature establish'd, the Naturalist (except in some few cases, where God or incorporeal Agents interpose,) has recourse to the first Cause but for its general and ordinary support and influence, whereby it preserves Matter and Motion from annihilation or desition; and in explicating *particular Phænomena* considers onely the *Size*, *Shape*, *Motion*, (or *want of it*,) *Texture*, and the resulting qualities and attributes of the small particles of Matter. And thus in this great *Automaton* the world, (as in a Watch or Clock,) the materials it consists of being left to themselves could never at the first convene into so curious an Engine: and yet when the skilful Artist has once made and set it a going, the *Phænomena* it exhibits are to be accounted for by the *number*, *bigneße*, *proportion*, *shape*, *motion* (or *endeavour*,) *rest*, *coaptation*, and other Mechanical affections of the spring, wheels, pillars, and other parts it is made up of: and those effects of such a Watch that cannot this way be explicated, must,

* *Epicurus* in his Epistle to *Pythocles*.

for

for ought I yet know be confeſs'd not to be ſufficiently underſtood.

But to return thither whence my duty to the Author of Nature oblig'd me to make this ſhort digreſſion.

The hitherto propoſ'd *Hypotheſis*, touching the Origination of Forms, *hath*, I hope, been rendred probable by diverſe particulars in the paſt diſcourſes, and *will* be both exemplify'd and confirm'd by ſome of the Experiments, that make the latter part of this preſent Treatiſe, (eſpecially the fifth and ſeaventh of them,) which, containing Experiments of the changing the Form of a Salt and a Metal, do chiefly belong to the Hiſtorical or Experimental part of what we deliver touching the Origine of Forms. And indeed, beſides the *two kinds* of Experiments preſently to be mention'd, we might here preſent you a Third ſort, conſiſting *partly* of diverſe relations of Metalline Tranſmutations, deliver'd upon their own credit by credible men that are not Alchymiſts, and *partly* of ſome Experiments (ſome made, ſome directed by us) of changing both Bodies totally *inflammable* almoſt totally into *Water*, and a good part even of *diſtill'd Rain water* without additament into *Earth*; and diſtill'd Liquors, readily & totally mingleable with water, *pro parte* into a true *Oyle* that will not mix with it. This ſort of Experiments, I ſay, I might here annex, if I thought fit, in this place, either to

lay any ſtreſſe upon thoſe that I cannot my ſelf make out, or to transfer hither thoſe Experiments of changes amongſt Bodies not metalline, that belong to another *Treatiſe. But over and above what the paſt Notes and the Experiments that are to follow them contain towards the making of what we teach concerning Forms, we will here for further confirmation proceed to add two ſorts of Experiments, (beſides the third already mention'd.) *The one*, wherein it appears, that Bodies of very differing natures, being put together, like the wheels and other pieces of a Watch, and by their connexion acquiring a new Texture, and ſo new Qualities, may, without having recourſe to a ſubſtantial Form, compoſe ſuch a new Concrete, as may as well deſerve to have a ſubſtantial Form attributed to it, by vertue of that new diſpoſition of its parts, as other Bodies that are ſaid to be endow'd therewith: and the *other*, that a Natural Body being diſſipated, and as it were taken in pieces like a Watch, may have its parts ſo aſſociated, as to conſtitute new Bodies of natures very differing from its own, and from each other; and yet theſe diſſipapated & ſcatter'd parts, by being recollected and put together again like the pieces of a Watch, in the like order as before, may recompoſe (almoſt, if not more then almoſt) ſuch another Body, as that they made up before they were taken aſunder.

* The Sceptical Chymiſt.

I.

EXPERIMENTS and THOUGHTS about the *Production* and *Reproduction* of *FORMS.*

IT was not at random that I ſpoke, when, in the foregoing Notes about the Origine of Qualities, I intimated, that twas very much by a kind of tacit agreement, that men had diſtinguiſh'd the *Species* of Bodies, and that thoſe Diſtinctions were more arbitrary then we are wont to be aware of. For I confeſſe, that I have not yet either in *Ariſtotle* or any other Writer met with any genuine and ſufficient Diagnoſtick and boundary for the diſcriminating and limiting the *Species* of things, or to ſpeak more plainly, I have not found that any Naturaliſt has laid down a determinate number and ſort of Qualities or other attributes, which is *ſufficient* and *neceſſary* to conſtitute all portions of Matter, endow'd with them, diſtinct kinds of Natural Bodies. And therefore I obſerve, that moſt commonly men look upon theſe as diſtinct *ſpecies* of Bodies, that have had the luck

to have distinct names found out for them; though perhaps diverse of them differ much less from one another then other Bodies, which (because they have been hudled up under one name,) have been look'd upon as but one sort of Bodies. But not to lay any weight on this intimation about Names, I found, that for want of a true Characteristick or discriminating notes, it hath been and is still both very *uncertain* as to divers Bodies, whether they are of different *Species* or of the same, and very *difficult* to give a sufficient reason, why diverse bodies, wherein Nature is assisted by Art, should not as well passe for distinct kinds of Bodies, as others, that are generally reckon'd to be so.

Whether (for instance) Water and Ice be not to be esteem'd distinct kinds of Bodies, is so little evident, that some, that pretend to be very well vers'd in *Aristotle's* writings and opinions, affirm him to teach, that Water looses not its own nature by being turn'd into Ice; and indeed I remember I have read a * Text of his, that seems expresse enough to this purpose, and the thing it self is made plausible by the reducibleness of ice back again into water. And

*See *Lib.* 1. *de Gen. & Corr. t.* 80. Idem corpus (saies he there) *quamquam continuum, alias liquidum, alias concretum videmus, non divisione aut compositione hoc passum, aut conversione, aut attactu, sicuti Democritus asserit: nam neque transpositione, neque* Naturæ demutatione (ὲ τὸ μετασάλλον τὴν φύσιν) *ex liquido concretum evadere solet.*

yet

yet I remember, *Galen* is affirm'd to make these two, distinct *species* of Bodies; which doctrine is favour'd by the differing qualities of Ice and Water; for not onely the one is fluid, and the other solid and even brittle, but Ice is also commonly more or lesse opacous in comparison of water, being also lighter then it *in specie*, since it swims upon it. To which may be added, that Ice beaten with common salt will freez other Bodies, when Water mingled with salt will not. And on this occasion I would propose to be resolv'd, whether Must, Wine, spirit of Wine, Vinegar, Tartar, and Vappa, be specifically distinct Bodies? and the like questions I would ask concerning a Hens egge, and the Chick that is afterwards hatcht out of it: as also concerning Wood, Ashes, Soot, and likewise the eggs of Silkworms, which are first small Caterpillars, or (as some think them) but Wormes, when they are newly hatch'd, and then *Aurelia's*, (or husked Maggots,) and then Butterflies, which I have observ'd with pleasure to be the successive production of the prolifick seed of Silkworms. And whether the answer to these Queries be affirmative or negative, I doubt the reason that will be given for either of the two, will not hold in diverse cases whereto I might apply it. And a more puzling question it may be to some, whether a Charcoal, being throughly kindled, do specifically differ from another charcoal? for, accor-

ding to thoſe I argue with, the fire has *penetrated* it quite through; and therefore ſome of the recent *Ariſtotelians* are ſo convinc'd of its being tranſmuted, that all the ſatisfaction I could find from a very ſubtle modern Schoolman to the Objection, that if the glowing coal were plung'd into water, it would be a black coal agen, was, that notwithſtanding That reduction, the Form of a Chareoal had been once aboliſh'd by the fire, and was reproduc'd by God, upon the regain'd diſpoſition of the Matter to receive it.

Nor is it very eaſie to determine, whether Clouds, and Rain, and Hail, and Snow be bodies ſpecifically diſtinct from Water and from each other, and the writers of Meteors are wont to handle them as diſtinct. And if ſuch ſlight differences as thoſe that diſcriminate theſe Bodies, or that which diſtinguiſhes Wind from Exhalations, whoſe courſe makes it be ſufficient to conſtitute differing kinds of Bodies, 'twill be hard to give a ſatisfactory reaſon, why other Bodies, that differ in more or more conſiderable particulars, ſhould not enjoy the ſame priviledge. And I preſume, that Snow differs leſſe from Rain, then Paper doth from Rags, or Glaſſe made of wood-aſhes does from Wood. And indeed men having by tacit conſent agreed to look upon Paper, and Glaſs, & Sope, & Sugar, and Braſſe, and Ink, and Pewter, and Gunpowder, and I know not how many others, to be di-

ſtinct

ſtinct ſorts of Bodies, I ſee not, why they may not be thought to have done it on as good grounds, as thoſe, upon which divers other differing *Species* of Bodies have been conſtituted. Nor will it ſuffice to object, that theſe Bodies are *factitious*; for 'tis the preſent nature of Bodies, that ought to be conſider'd in referring them to *Species*, which way ſoever they came by that Nature: for Salt, that is in many Countries made by boiling Sea water in Cauldrons and other veſſels, is as well true Sea-ſalt, as that which is made in the Iſle of *Man*, (as Navigators call it,) without any cooperation of Man, by the bare action of the Sun upon thoſe parts of the Sea water, which chance to be left behind in hollow places, after a high Spring-tide. And Silk-worms, which will hatch by the heat of humane Bodies, and Chickens, that are hatch'd in *Ægypt* by the heat of Ovens or Dunghils, are no leſſe true Silk-worms or Chickens, then thoſe that are hatch'd by the Sun or by Hens.

As for what may be objected, that we muſt diſtinguiſh betwixt Factitious Bodies and Natural, I will not now ſtay to examine, how far that Diſtinction may be allow'd: for it may ſuffice for our preſent purpoſe to repreſent, that whatever may be ſaid of Factitious Bodies, where Man does, by Inſtruments of his own providing, onely give Figure, or alſo Contexture to the *ſenſible* (not inſenſible) parts of the Matter he works upon; as when a Joyner makes a Stool,

or

or a Statuary makes an Image, or a Turner a Bowl: yet the case may be very differing in those other factitious Productions, wherein the *insensible* parts of Matter are alter'd by Natural Agents, who performe the greatest part of the work among themselves, though the Artificer be an Assistent, by putting Them together after a due manner. And therefore I know not, why all the Productions of the Fire made by Chymists should be look'd upon, as not Natural, but Artificial Bodies: since the Fire, which is the grand Agent in these changes, doth not, by being imploy'd by the Chymist, cease to be and to work as a Natural Agent. And since Nature her self doth, by the help of the fire, sometimes afford us the like Productions that the Alchymists art presents us: as in *Ætna*, *Vesuvius*, and other burning Mountains, (some of whose Productions I can shew you,) Stones are sometimes turn'd into Lime, (and so an Alkalizate Salt is produc'd,) and sometimes, if they be more dispos'd to be flux'd then calcin'd, brought to vitrification; Metalline and Mineral Bodies are by the violence of the fire colliquated into masses of very strange and compounded Natures: Ashes and Metalline flowers of divers kinds are scatter'd about the neighbouring places, and copious flowers of Sulphur, sublim'd by the internal fire, have been severall times found about the Vents, at which the Fumes are discharg'd into the Air: (As I have been assur'd by

by Ingenious Viſitors of ſuch Places, whom I purpoſely inquir'd of, touching theſe *flores*; for of theſe Travellers more then one anſwer'd me, they had themſelves gather'd, and had brought ſome very good.) Not to adde, that I have ſometimes ſuſpected, upon no abſurd grounds, that divers of the Minerals and other Bodies, we meet with in the lower parts of the Earth, and think to have been formed and lodg'd there ever ſince the beginning of things, have been ſince produc'd there by the help of ſubterraneal fires or other heats, which may *either* by their immediate action and exceedingly long application very much alter ſome Bodies by changing their Texture; as when Lead is turn'd into Minium, and Tin into Putty by the operation of the fire in a few hours, *or* by elevating, in the forme of Exhalations or Vapours, divers Saline and Sulphureous Corpuſcles or Particles of unripe (or to uſe a Chymical term of Art) Embrionated Minerals, and perhaps Mettals, which may very much alter the Nature, and thereby vary the Kind of other ſubterraneal Bodies, which they pervade, and in which they often come to be incorporated; *or elſe* may, by convening among themſelves, conſtitute particular Concretions, as we ſee that the fumes of Sulphur and thoſe of Mercury unite into that lovely red maſſe, which in the Shops they call Vermilion, and which is ſo like to the Mineral, whence we uſually obtain

or a Statuary makes an Image, or a Turner a Bowl: yet the caſe may be very differing in thoſe other factitious Productions, wherein the *inſenſible* parts of Matter are alter'd by Natural Agents, who performe the greateſt part of the work among themſelves, though the Artificer be an Aſſiſtent, by putting Them together after a due manner. And therefore I know not, why all the Productions of the Fire made by Chymiſts ſhould be look'd upon, as not Natural, but Artificial Bodies: ſince the Fire, which is the grand Agent in theſe changes, doth not, by being imploy'd by the Chymiſt, ceaſe to be and to work as a Natural Agent. And ſince Nature her ſelf doth, by the help of the fire, ſometimes afford us the like Productions that the Alchymiſts art preſents us: as in *Ætna*, *Veſuvius*, and other burning Mountains, (ſome of whoſe Productions I can ſhew you,) Stones are ſometimes turn'd into Lime, (and ſo an Alkalizate Salt is produc'd,) and ſometimes, if they be more diſpoſ'd to be flux'd then calcin'd, brought to vitrification; Metalline and Mineral Bodies are by the violence of the fire colliquated into maſſes of very ſtrange and compounded Natures: Aſhes and Metalline flowers of divers kinds are ſcatter'd about the neighbouring places, and copious flowers of Sulphur, ſublim'd by the internal fire, have been ſeverall times found about the Vents, at which the Fumes are diſcharg'd into the Air: (As I have been aſſur'd by

by Ingenious Visitors of such Places, whom I purposely inquir'd of, touching these *flores*; for of these Travellers more then one answer'd me, they had themselves gather'd, and had brought some very good.) Not to adde, that I have sometimes suspected, upon no absurd grounds, that divers of the Minerals and other Bodies, we meet with in the lower parts of the Earth, and think to have been formed and lodg'd there ever since the beginning of things, have been since produc'd there by the help of subterraneal fires or other heats, which may *either* by their immediate action and exceedingly long application very much alter some Bodies by changing their Texture; as when Lead is turn'd into Minium, and Tin into Putty by the operation of the fire in a few hours, *or* by elevating, in the forme of Exhalations or Vapours, divers Saline and Sulphureous Corpuscles or Particles of unripe (or to use a Chymical term of Art) Embrionated Minerals, and perhaps Mettals, which may very much alter the Nature, and thereby vary the Kind of other subterraneal Bodies, which they pervade, and in which they often come to be incorporated; *or else* may, by convening among themselves, constitute particular Concretions, as we see that the fumes of Sulphur and those of Mercury unite into that lovely red masse, which in the Shops they call Vermilion, and which is so like to the Mineral, whence we usually

obtain

obtain Mercury, that the *Latines* give them both the ſame Name *Cinnabaris*, and in that are imitated by the French and Italians; in whoſe favour I ſhall adde, that if we ſuppoſe this Mineral to conſiſt of a ſtony concretion, penetrated by ſuch Mineral fumes as I have been ſpeaking of, the Appellation may be better excuſ'd then perhaps you imagine, ſince from *Cinnabaris nativa* not onely I obtain'd a conſiderable quantity of good running Mercury, (which is that, Men are wont to ſeek for from it,) but to gratifie my Curioſity ſomewhat further, I try'd an eaſie way, that came into my mind, whereby the *Caput mortuum* afforded me no deſpicable Quantity of good combuſtible Sulphur. But this upon the by, being not oblig'd to ſet down here the grounds of my Paradoxical Conjecture about the Effects of ſubterraneal Fires and Heats, ſince I here lay no ſtreſſe upon it, but return to what I was ſaying about *Ætna*, and other Volcans. Since then theſe Productions of the Fire, being of Nature's own making, cannot be deny'd to be Natural Bodies, I ſee not why the like Productions of the Fire ſhould be thought unworthy that Name, onely becauſe the Fire, that made the former, was kindled by chance in a Hill, and that which produc'd the latter was kindled by a man in a Furnace. And if flower of Sulphur, Lime, Glaſſe, and colliquated mixtures of Metals and Minerals are to be reckon'd among Natural Bodies, it ſeems to be

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but reaſonable, that, upon the ſame grounds; we ſhould admit flower of Antimony, Lime, and Glaſſe, and Pewter, and Braſſe, and many other Chymicall Concretes, (if I may ſo call them) to be taken into the ſame number; and then 'twill be evident, that to diſtinguiſh the *ſpecies* of Natural Bodies, a concourſe of Accidents will, without conſidering any Subſtantial Form, be ſufficient.

But becauſe I need not, on this occaſion, have recourſe to inſtances of a diſputable nature, I will pitch, for the illuſtration of the Mechanical Production of Forms, upon Vitriol. For ſince Nature her ſelfe, without the help of Art, does oftentimes produce that Concrete, (as I have elſewhere ſhewn by Experience,) there is no reaſon why Vitriol, produc'd by eaſie Chymical Operations, ſhould not be look'd upon as a Body of the ſame Nature and Kind. And in Factitious Vitriol, our knowing what Ingredients we make uſe of and how we put them together inables us to judge very well how Vitriol is produc'd. But becauſe it is wont to be reckon'd with Sal-petre, Sea-ſalt, and Sal Gem among true Salts, I think it requiſite to take notice in the firſt place, that Vitriol is not a meer Salt, but that which *Paracelſus* ſomewhere and after him divers other Spagyriſts call a Magiſtery, which in their ſenſe (for there are that uſe it in another,) commonly ſignifies

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a Preparation, wherein the Body to be prepar'd has not its *Principles ſeparated*, as in Diſtillation, Incineration, *&c.* but wherein the *whole Body* is brought into another forme, by the *addition* of ſome Salt or Menſtruum, that is united *per minima* with it. And agreeably to this notion we find, that from common Vitriol, whether native or factitious, may be obtain'd (by Diſtillation and Reduction) an acid Saline Spirit, and a Metalline Subſtance, as I elſewhere mention, that from blew Vitriol, Copper may be (by more then one way) ſeparated. And I the rather give this Advertiſement, becauſe that *as* there is a Vitriol of Iron, which is uſually green, and another of Copper, which is wont to be blew, and alſo a white Vitriol, about which it is diſputed what it holds, (though that it holds ſome Copper I have found;) and yet all of theſe are without ſcruple reputed true Vitriols, notwithſtanding that they differ ſo much in Colour, and (as I have diſcover'd) in ſeveral other Qualities; *ſo* I ſee no reaſon, why the other Minerals, being reduc'd by their proper Menſtruums into Salt like Magiſteries, may not paſſe for the Vitriols of thoſe Metals, and conſequently for Natural Bodies: which if granted, will adde ſome confirmation to our Doctrine, though its being granted is not neceſſary to make it out. For to confine our ſelves to Vitriol, 'tis known among Chymiſts, that if upon the filings of *Mars* one put a convenient quantity of

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that acid distill'd Liquor, which is (abusively) wont to be call'd Oyl of Vitriol, diluting the mixture with Rain or with common Water, 'tis easie by Filtrating the Solution, by Evaporating the Aqueous superfluity of it, and by leaving the rest for a competent while in a Cellar, (or other cold place) to Chrystallize, 'tis easie, I say, by this means to obtain a Vitriol of Iron; which agrees with the other Vitriol of Vitriol-stones or Marchasites, presented us by Nature, without the help of any other Menstruum, then the Rain that falls upon them from the Clouds, in I know not how many Qualities, part Obvious, and part of them Occult: As, (of the *first sort*) in Colour, Transparency, Brittleness, easiness of Fusion, Stypticall tast, reducibleness to a Red Powder by Calcination, and other Qualities more obvious to be taken notice of; to which may be annex'd divers Qualities of the *second sort*, (I mean the more abstruse ones,) as the power to turn in a trice an Infusion of Galls, made in ordinary water, (as also to turn a certain clear Mineral Solution, elsewhere mention'd,) into an Inckly colour, to which, in all propability, we may adde a faculty of causing Vomits even in a small Dose, when taken into the Stomach of a Man, and that remarkable property of being endow'd with as exact and curious a shape or figure, as Those, for which Salts have been, by moderne Philosophers especially, so much admir'd. But, that

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no ſcruple might ariſe from hence, that in the *Vitriolum Martis* wont to be made by Chymiſts, the Menſtruum, that is imploy'd, is the Oyl of common Vitriol, which may be ſuſpected to have retain'd the nature of the Concrete whence it proceeded, and ſo this Factitious Vitriol may not be barely a new Production, but partly a Recorporification, as they ſpeak of the Vitriolate Corpuſcles contain'd in the Menſtruum: To prevent this Scruple I ſay, (which yet perhaps would not much trouble a conſidering Chymiſt,) I thought fit to imploy a quite other Menſtruum, that would not be ſuſpected to have any thing of Vitriol in it. And though *Aqua fortis* and Spirit of Nitre, however they *corrode* Mars, are unfit for ſuch a work, yet having pitch'd upon Spirit of Salt inſtead of Oyl of Vitriol, and proceeding the ſame way that has been already ſet down, it anſwer'd our Expectation, and afforded us a good green Vitriol. Nor will the great diſpoſition I have obſerv'd in this our Vitriol to reſolve, by the moiſture of the Air, into a Liquor, make it eſſentially differing from other Vitriols, ſince it has been obſerv'd, and particularly by *Guntherus Belichius* more then once, that even the common Vitriol he uſ'd in *Germany*, will alſo, though not ſo eaſily as other Salts, run (as the Chymiſts phraſe it) *per deliquium*. And to make the Experiment more compleat, though we did not find either Oyl of Vitriol, or Spirit of Salt,

Salt good Menſtruums to make a blew Venereal Vitriol out of Copper, (however fil'd or thinly laminated,) and though upon more tryals then one, it appear'd, that *Aqua fortis* and Spirit of Nitre, which we thought fit to ſubſtitute to the above mention'd Liquors, did indeed make a Solution of Copper, but ſo unctuous a one, that twas very hard to bring any part of it to dryneſſe, without ſpoyling the Colour and Shape of the deſir'd Body: yet repeating the Experiment with care and watchfulneſſe, we, this way, obtain'd one of the loveliest Vitriols that hath perhaps been ſeen, and of which you your ſelf may be the judg by a parcel of it I keep by me for a Rarity.

To apply now theſe Experiments, eſpecially That, wherein Spirit of Salt is imploy'd, to the purpoſe, for which I have mention'd them, let us briefly conſider theſe two things; the one, that our factitious Vitriol is a Body, that, as well as the Natural, is endow'd with many Qualities, (manifeſt, and occult,) not onely ſuch as are common to it with other Salts, as Tranſparency, Brittleneſſe, Solubleneſſe in Water, *&c.* but ſuch as are Properties peculiar to it, as Greenneſſe, eaſineſſe of Fuſion, Stypticity of Taſt, a peculiar Shape, a power to ſtrike a Black with infuſion of Galls, an Emetick faculty, *&c.*

The other thing we are to conſider is, that though theſe Qualities are in common Vitriol believ'd to flow from the ſubſtantial Form of

the Concrete, and may, as justly as the Qualities, whether manifest or occult, of other Inanimate Bodies, be imploy'd as Arguments to evince such a Form: yet in our Vitriol, made with Spirit of Salt, the same Qualities and Properties were produc'd by the associating and juxta-position of the two Ingredients, of which the Vitriol was compounded; the mystery being no more but this, that the Steel being dissolv'd in the Spirit, the Saline particles of the former and the Metalline ones of the latter having each their determinate Shapes, did by their Association compose divers Corpuscles of a mix'd or compounded Nature, from the convention of many whereof there resulted a new Body of such a Texture, as qualify'd it to affect our Sensories, and work upon other Bodies, after such a manner as common Vitriol is wont to do. And indeed in our case, not onely it cannot be made appear, that there is any substantial Form generated anew, but that there is not so much as an exquisite mixture, according to the common notion the Schools have of such a mixture. For both the Ingredients retaine their Nature, (though perhaps somewhat alter'd,) so that there is, as we were saying, but a Juxta-position of the Metalline and Saline Corpuscles; onely they are associated so, as by the manner of their coalition to acquire that new Texture, which denominates the Magistery they compose, Vitriol. For 'tis evident, that the Saline Ingredient

dient may either totally, or for much the greatest part be ſeparated by Diſtillation, the Metalline remaining behind. Nay ſome of the Qualities, we have been aſcribing to our Vitriol, do ſo much depend upon Texture, that the very Beams of the Sun (converg'd) will, as I have purpoſely try'd, very eaſily alter its Colour, as well as ſpoyl its Tranſparency, turning it at firſt from Green to White, and if they be concenter'd by a good Burning glaſſe, making it change that Livery for a deep Red.

Doubts and Experiments touching the curious Figures of Salts.

And here let me take notice, that though the exact and curious Figures, in which Vitriol and other Salts are wont to ſhoot, be made Arguments of the *Preſence*, and great Inſtances of the *Plaſtick skill* of ſubſtantial Forms and Seminal Powers, yet, I confeſſe, I am not ſo fully ſatisfied in this matter, as even the Modern Philoſophers appear to be. 'Tis not that I deny, that *Plato*'s excellent Saying, γεωμετρεῖ ὁ θεὸς may be apply'd to theſe exquiſite Productions of Nature. For though God has thought fit to make things Corporeal after a much more facile and intelligible way, then by the intervention of ſubſtantial Forms; and though the Plaſtick power of Seeds, which in Plants and Ani-

mals I willingly admit, ſeem not in our caſe to be needful; yet is the Divine Architect's Geometry (if I may ſo call it) nevertheleſſe to be acknowledg'd and admir'd; for having been pleas'd to make the *primary* and inſenſible Corpuſcles of Salts and Metals of ſuch determinate, curious, and exact Shapes, that as they happen to be aſſociated together, they ſhould naturally produce Concretions, which, though *differingly* figur'd according to the reſpective natures of their Ingredients, and the various manners of their convening, ſhould yet be all of them very *curious*, and ſeem elaborate in their kinds. How little I think it fit to be allow'd, that the Bodies of Animals, which conſiſt of ſo many curiouſly fram'd and wonderfully adapted Organical parts, (and whoſe Structure is a thouſand times more Artificial then that of Salts and Stones and other Minerals,) can be reaſonably ſuppos'd to have been produc'd by Chance, or without the guidance of an Intelligent Author of things, I have elſewhere largely declar'd. But I confeſſe, I look upon theſe Figures we admire in Salts, and in ſome kinds of Stones, (which I have not been Incurious to collect,) as Textures ſo ſimple and ſlight in compariſon of the Bodies of Animals, and oftentimes in compariſon of ſome one Organical part, that I think it cannot be in the leaſt inferr'd, that becauſe ſuch ſlight Figurations need not be aſcrib'd to the Plaſtick power of Seeds, it is not neceſſary,

ſary, that the ſtupendious and incomparably more elaborate fabrick and ſtructure of Animals themſelves ſhould be ſo. And this premiſ'd, I ſhall adde, that I have been inclin'd to the Conjecture about the ſhapes of Salts, that I lately propoſ'd, by theſe conſiderations.

Firſt, that by a bare Aſſociation of Metalline and Saline Corpuſcles, a Concrete, as finely figur'd as other Vitriols, may be produc'd, as we have lately ſeen.

Secondly, becauſe that the Figures of theſe Salts are not conſtantly in all reſpects the ſame, but may in diverſe manners be ſomewhat varied, as they happen to be made to ſhoot more haſtily or more leiſurely, and as they ſhoot in a ſcanter or in a fuller proportion of Liquor. This may be eaſily obſerv'd by any, that will but with a little attention conſider the difference that may be found in Vitriolate Chryſtals or Grains, when quantities of them were taken out of the great Coolers, as they call them, wherein that Salt, at the Works where 'tis boyl'd, is wont to be ſet to ſhoot. And accordingly where the Experienc'd Mineraliſt *Agricola* deſcribes the ſeveral wayes of making Vitriol in great quantities, he does not onely more then once call the great Grains or Chryſtals, into which it coagulates, Cubes; but ſpeaking of the manner of their Concretion about the Cord's or Ropes, that are wont (in *Germany*) to be hang'd from certain croſſe Bars into the Vitriolate Wa-

ter or Solution for the Vitriol to faſten its ſelf to; he compares the concretions indifferently to Cubes or Cluſters of Grapes: *Ex his* (ſayes he, ſpeaking of the croſſe Barres,) *pendent reſtes lapillis extentæ, ad quos humor ſpiſſus adhæreſcens denſatur in tranſlucentes atramenti ſutorii vel Cubos, vel Acinos, qui uvæ ſpeciem gerunt.* I remember alſo, that having many years ſince a ſuſpicion, that the Reaſon why *Alkalys*, ſuch as Salt of Tartar and Pot-aſhes are wont to be, obtain'd in the form of white Powders or *Calces*, might be the way, wherein the Water or the Lixiviums, that contain them, is wont to be drawn off, I fancied, that by leaving the Saline Corpuſcles a competent quantity of Water to ſwimme in, and allowing them leiſure for ſuch a multitude of occurſions, as might ſuffice to make them hit upon more congruous coalitions then is uſual, I might obtain Chryſtals of Them, as well as of other Salts: conjecturing this, I ſay, I cauſ'd ſome well purify'd *Alkalys* diſſolv'd in clear water to be ſlowly evaporated, till the top was cover'd with a thin Ice-like Cruſt, then taking care not to break That, leaſt they ſhould (as in the ordinary way, where the Water is all forc'd off,) want a ſufficient ſtock of Liquor, I kept them in a very gentle heat for a good while; and then breaking the above mentioned Ice-like Cake, I had, as I

* *Georg. Agricola de re metall.* lib. 12. p. 462.

wiſh'd,

with'd, divers figured lumps of Chrystalline Salt shot in the Water, and transparent almost like white Sugar Candy.

I likewise remember, that having on several occasions distill'd a certain quantity of oyl of Vitriol with a strong solution of Sea-salt, till the remaining Matter was left dry, that Saline Residue being dissolv'd in fair water, filter'd and gently evaporated, would shoot into Chrystals, sometimes of one figure, sometimes of another, according as the quantity or strength of the Oyl of Vitriol and other Substances determin'd. And yet these Chrystals, though sometimes they would shoot into Prismelike Figures, as roch'd Petre; and sometimes into shapes more like to Allome or Vitriol; nay though oftentimes the same *caput mortuum* dissolv'd would in the same Glasse shoot into Chrystals, whereof some would be of one shape, some of another; yet would these differing Grains or Chrystals appear for the most part more exquisitely figur'd, then oftentimes Vitriol does. From Spirit of Urine and Spirit of Nitre, when I have suffer'd them to remain long together before Coagulation, and free'd the mixture from the superfluous moisture very slowly, I have sometimes obtain'd fine long Chrystals (some of which I can shew you) so shap'd, that most Beholders would take them for Chrystals of Salt-petre. And I have likewise tryed, that whereas Silver is wont to shoot into Plates exceeding thin,

almoſt like thoſe of *Moſcovia* glaſſe, when I have diſſolv'd a pretty quantity of it in *Aqua fortis* or ſpirit of Nitre, and ſuffer'd it to ſhoot very leiſurely: I have obtain'd Lunar Chryſtals, (ſeveral of which I have yet by me,) whoſe figure, though ſo pretty as to have given ſome wonder even to an Excellent Geometrician, is differing enough from that of the thin Plates formerly mention'd; each Chryſtal being compoſ'd of many ſmall and finely ſhap'd Solids, that ſtick ſo congruouſly to one another, as to have one ſurface, that appear'd Plain enough, common to them all.

Thirdly, that inſenſible Corpuſcles of different, but all of them exquiſite, ſhapes, and endowed with plain as well as ſmooth ſides, will conſtitute Bodies variouſly, but all very finely figur'd, I have made uſe of ſeveral waies to manifeſt. And firſt, though Harts-horn, Bloud, and Urine, being reſolv'd, and (as the Chymiſts ſpeak) Analiz'd by Diſtillation, may well be ſuppoſ'd to have their ſubſtantial Forms (if they had any) deſtroy'd by the action of the Fire: yet in regard the Saline Particles, they contain, are endow'd with ſuch figures as we have been ſpeaking of, when in the Liquor, that abounds with either of theſe volatile Salts, the diſſolv'd Particles do leiſurely ſhoot into Chryſtals, I have divers times obſerv'd, in theſe, many Maſſes, (ſome bigger and ſome leſſe,) whoſe ſurfaces had Plains, ſome of Figures, as to

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ſenſe, exactly Geometrical, and others very curious and pleaſant. And of theſe finely ſhap'd Chryſtals of various ſizes I have pretty ſtore by me. And becauſe (as it may be probably gather'd from the event) the ſaline Corpuſcles of Stillatitious acid liquors, and thoſe of many of the Bodies they are fitted to diſſolve, have ſuch kind of figures as we have been ſpeaking of, when the ſolutions of theſe Bodies, upon the receſſe of the ſuperfluous moiſture, ſhoot into Chryſtals; theſe, though they will ſometimes be differing enough, according to the particular natures of the diſſolv'd Bodies and the Menſtruum, yet either the Chryſtals themſelves, or their Surfaces, or both, will oftentimes have fine and exquiſite figures; as I have try'd by a Menſtruum, wherewith I was able to diſſolve ſome Gems, as alſo with a ſolution of Coral, made with ſpirit of Verdigreeſe, to omit other Examples. And for the ſame reaſon when I try'd whether the particles of Silver, diſſolv'd in *Aqua fortis*, would not, without concoagulating with the Salts, convene, upon the account of their own ſhapes, into little concretions of ſmooth and flat ſurfaces, I found, that having (to afford the Metalline Corpuſcles ſcope to move in) diluted one part of the Solution with a great many parts of diſtill'd Rain water, (for common water will oftentimes make ſuch Solutions become white or turbid,) a plate of Copper being ſuſpended in the liquor, and ſuf-

fer'd

fer'd to lie quiet there a while, (for it need not be long) there would ſettle all about it ſwarms of little Metalline and undiaphanous Bodies, ſhining in the water like the ſcales of ſmall Fiſhes, but form'd into little plates extremely thin, with ſurfaces not onely flat, but exceeding glofſy: and among thoſe, diverſe of the larger were prettily figur'd at the edges. And as for Gold, its Corpuſcles are ſufficiently diſpoſ'd to convene with thoſe of fit or congruous Salts into concretions of determinate ſhapes, as I have found in the Chryſtals I obtain'd from Gold diſſolv'd in *Aqua Regis*, and after having been ſuffer'd to looſe its ſuperfluous moiſture, kept in a cold place: and not onely ſo, but alſo when by a more powerful Menſtruum I had ſubdivided the body of Gold into ſuch minute particles that they were ſublimable, (for That I can aſſure you is poſſible,) theſe volatile particles of Gold, with the Salts wherewith they were elevated, afforded me (ſometimes) ſtore of Chryſtals, which, though not all of them near of the ſame bigneſſe, reſembled one another in their ſhape, which was regular enough, and a very pretty one. But of this more elſewhere.

§. I remember I have alſo long ſince taken pleaſure to diſſolve two or more of thoſe ſaline Bodies, whoſe ſhapes we know already, in fair water, that by a very gentle Evaporation I might obtain concretions whoſe ſhapes ſhould be, though curious, yet differing from the figure of either of

of the Ingredients. But we muſt not expect, that in all caſes the Salts diſſolv'd together ſhould be *totally* compounded: for oftentimes they are of ſuch different natures, that one will ſhoot much ſooner then another, and then it frequently happens that a good proportion of that will be firſt Chryſtalliz'd in its own ſhape; as is conſpicuouſly to be obſerv'd in the refining of that impure Petre, (which from the Country that affords it the Purifiers call *Barbary* Nitre,) from the common Salt it abounds with: and (alſo) as *Agricola* obſerves,* that in ſome caſes, where a Vitriolate matter is mingled with that which yields Allom, thoſe two kinds of Salts will ſhoot ſeparately in the ſame large veſſel; (which the tryals I have made with the compounded Solutions of thoſe two Salts do not diſcountenance.) Now in ſuch caſes all that can be expected or needs be deſired, is, that the remaining part of the mixture or ſome portion of it afford Chryſtals or Grains of compounded ſolid figures. Though the *Venetian* Borax, wont to be ſold in ſhops, be known to be a factitious Body, compounded of ſeveral Salts that I ſhall not now ſtay to enumerate, and though, when we buy it, we uſually find it to conſiſt of lumps and grains miſhapen enough, yet when I diſſolv'd ſome of it in a good quantity of fair water, and made it coagulate very leiſurely, I had Chryſtals, upon whoſe ſurfa-

* *G. Agricola de re Metallica. lib.* 12.

ces

ces I could perceive very exquisite and, and as to sense, regular and Geometrical figures. And one thing I must not here by any means pretermit, which is, that though the *Caput mortuum* of common *Aqua fortis* consists of Bodies of very differing natures, (for such are Nitre and Vitriol,) and has been expos'd to a great violence of the Fire, yet I have sometimes admir'd the curiousnesse of those figures, that might be obtain'd barely by frequent Solutions and Coagulations of the saline particles of this *Caput mortuum* in fair water. But because the Glasses, wherein my Concretions were made, were too little to afford great Chrystals, and they ought to shoot very slowly; I chose rather to shew the curious some large Chrystals, which I took out of the Laboratory of an ingenious Person, who, without minding the figures, had upon my recommendation made great quantity of that Salt in large vessels for a Medicine: (it being the *Panacea duplicata*, so famous in *Holstein*.) For *diverse* of these Chrystals have not onely Triangles, Hexagons, and Rhomboides, and other figures exquisitely cut on their smooth and specular surfaces, and *others*, Bodies of Prismatical shapes: But some of them are no lesse accurately figur'd then the finest Nitre or Vitriol I remember my self to have observ'd, and some also terminate in Bodies almost like Pyramids, consisting of divers Triangles, that meet in one Vertical point, and are no lesse admirably

shap'd

ſhap'd then the fairer ſort of *Corniſh* Diamonds; that have been brought me for rarities. Beſides the producing of Salts of new ſhapes by compounding of ſaline Bodies, I have found it to be practicable not onely in ſome groſſe, or, as they ſpeak, corporal Salts, ſuch as Sea-ſalt, Salt-petre, but alſo in ſome Natural and ſome Chymical Salts diſſolv'd together; and, which perhaps you will think more conſiderable in ſaline Spirits made by diſtillation: Not that all of them are fit for this purpoſe, but that I have found diverſe of thoſe, that work upon one another with Ebullition, to be ſo. For in that conflict the ſaline Corpuſcles come to be aſſociated to one another, and thereby, or by their newly acquir'd figure, whilſt their coalition laſts, to looſe much of their former volatility: ſo that upon Evaporation of the ſuperfluous liquor, they will not fly as otherwiſe they might, but concoagulate into finely ſhap'd Chryſtals, as I have try'd among other ſaline liquors with ſpirit of Urine, and ſpirit of Nitre, and with oyl of Vitriol, and ſpirit of fermented Urine with ſpirit of Sheeps bloud, and ſpirit of Salt, and alſo with the ſpirits of Salt and Urine; which laſt Experiment I the rather mention, becauſe it ſhews, by the difference of the Chryſtals, afforded by thoſe two liquors from the Chryſtals reſulting from one of them, namely the ſpirit of Urine, (or if you pleaſe, the volatile Salt wherewith it abounds,) con-

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coagulated with a fit doſe of oyl of Vitriol, how much thoſe compounded emergent figures depend upon the more ſimple figures of the ſaline Corpuſcles, that happen to convene into thoſe new Concretes. For the ſpirit of Urine, ſatiated with ſpirit of Salt, and both very gently, and not too far Evaporated, often afforded me Chryſtals, that differ'd exceedingly in ſhape from thoſe which I obtain'd from the ſame ſpirit of Urine, ſatiated either with oyl of Vitriol, or with ſpirit of Nitre. For, (to adde that upon the by,) that Salt, compounded of the two ſpirits of Urine and of common Salt, is wont to be very prettily figur'd, conſiſting of one long Beam as it were, whence on both ſides iſſue out far ſhorter Chryſtals, ſometimes perpendicular to that, and parallel to one another like the teeth in a Combe, and ſometimes ſo inclining, as to make the Whole appear almoſt like a Feather, which is the more remarkable, becauſe I have (many years ago) obſerv'd, that common *Sal* Armoniack, that is made of Urine and common Salt, both crude, with a proportion of Soot, will, if warily diſſolv'd and coagulated, ſhoot into Chryſtals of the like ſhape. How far the unknown figure of a Salt may poſſibly (for I fear it will not eaſily) be gueſs'd at by that of the figure which it makes with ſome other Salt, whoſe figure is already known, I leave to Geometricians to conſider, having I fear, inſiſted too long on this ſubject already.

But

But yet I muſt adde one particular more, which will as well illuſtrate and confirme much of what has been ſaid above touching the Origination of Vitriol, as ſhew, that the ſhape of Vitriol depends upon the Textures of the Bodies whereof it is compoſ'd.

Fourthly then, when I conſider'd, that (as I formerly noted) Vitriol being but a Magiſtery, made by the concoagulation of the Corpuſcles of a diſſolv'd Metal with thoſe of the Menſtruum, the Magiſteries of other Metals might without inconvenience be added, as other Vitriolate Concretes, to the green, the blew, and white Vitriol, that are without ſcruple referr'd to the ſame *ſpecies:* and when I conſider'd that oyl of Vitriol was not a fit Menſtruum to *diſſolve* diverſe of the Metals, nor even all thoſe that it will *corrode*, and that the like unfitneſs alſo is to be found in common ſpirit of Salt, I pitch'd upon *Aqua fortis* or ſpirit of Nitre, as that menſtruum which was likelieſt to afford variety of Vitriols: and acccordingly I found, that beſides the lovely Vitriol of Copper formerly mention'd, that liquor would with Quickſilver afford one ſort of Chryſtals, with Silver another, and with Lead a third; all which Chryſtals of Vitriol, as they differ'd from each other in other Qualities, (upon which ſcore you will find this Experiment elſewhere menti-on'd,) ſo they did very manifeſtly and conſiderably differ in ſhape: the Chryſtals of Silver ſhooting

ting in exceeding thin plates, and those of Lead and Quicksilver obtaining figures, though differing enough from each other, yet of a far greater depth and thickness, and lesse remote from the figure of common Vitriol or Sea salt: and yet all these Vitriols, especially that of crude Lead when it was happily made, had shapes curious and elaborate, as well as those we admire in common Vitriol or Sea-salt.

IF then these curious shapes, which are believed to be of the admirablest effects, and of the strongest proofs of substantial Forms, may be the results of Texture; and if Art can produce Vitriol it self as well as Nature, why may we not think that in ordinary *Phænomena*, that have much lesse of wonder, recourse is wont to be had to substantial Forms without any necessity? (Matter, and a convention of Accidents being able to serve the turn without them;) and why should we wilfully exclude those productions of the fire, wherein the Chymist is but a servant to Nature, from the number of Natural bodies? And indeed, since there is no certain Diagnostick agreed on, whereby to discriminate Natural and Factitious bodies, and constitute the *species* of both; I see not, why we may not draw arguments from the qualities and operations of several of those that are call'd Factitious, to shew how much may be ascrib'd to and perform'd by the Mechanical

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Characterization or *Stamp* of Matter: of which we have a noble instance in Gunpowder, wherein by a bare comminution and blending the Ingredients, Nitre, Charcoal, and Brimstone, which have onely a new and that an exceeding slight contexture, each retaining its own nature in the mixture; so that there is no colour afforded to the pretence of a substantial Form, there is produc'd a new Body, whose operations are more powerful and prodigious, then those of almost any Body of Natures own compounding. And though Glasse be but an artificial Concrete, yet, besides that tis a very noble and useful one, Nature her self has produc'd very few, if enough to make up a Number, more lasting & more unalterable. And indeed diverse of those factitious Bodies that Chymistry is able to afford us are endow'd with more various and more noble qualities, then many of those that are unquestionably Natural. And if we admit these Productions into the number of Natural Bodies, they will afford us a multitude of Instances, to shew, that Bodies may acquire many and noble qualities, barely by having Mechanical affections introduc'd by outward Agents into the Matter, or destroy'd there. As though Glasse be such a noble Body, as we have lately taken notice of, yet since tis Fusibility, Transparency, and Brittlenesse, that are its onely constituent Attributes, we can in lesse then an hour, (or, perhaps half that time,) turn

an opacous Body into transparent Glass, without the addition of any other visible Body, by a change of Texture made in the same Matter, and by another change of Texture, made without addition as formerly, we can in a trice reduce Glasse into or obtain from it a body not glassy, but opacous, and otherwise of a very differing nature, as it had been before. And here let me adde what may not a little conduce to our present design, that even those that imbrace *Aristotle's* principles do unawares confesse, that a slight change of Texture, without the introduction of a substantial Form, may not onely make a Specifical difference betwixt Bodies, but so vast a one, that they shall have differing *Genus'es*, and may (as the Chymists speak) belong to differing Kingdoms. For Coral, to passe by all other plants of that kind, that may be mention'd to the same purpose, whilst it grows in the bottom of the Sea, is a real Plant, and several times (which suffices for my present scope) hath been there found by an Acquaintance of mine, as well as by other Inquirers, soft and tender like another Plant. Nay I elsewhere * bring very good and recent Authority to prove, that it is oftentimes found very succulent, and does propagate its *species* as well as other Shrubs; and yet Coral, being gather'd and remov'd into the Air by

* In the Essays about things suppos'd to be spontaneously generated.

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the receſſe of its ſoul, no new Lapidi fick Form being ſo much as pretended to, turns into a Concretion, that is by many eminent Writers and others reckon'd among Lapideous ones: as indeed Coral does not burn like Wood, nor obey diſtillation like it; and not onely its *Calx* is very differing from the aſhes of Vegetables, and is totally ſoluble in diverſe acid liquors, and even ſpirit of Vinegar, but the uncalcin'd Coral it ſelf will be eaſily corroded by good Vinegar, after the ſame manner as I have ſeen *Lapis ſtellaris* and other unqueſtionably Mineral ſtones diſſolv'd, ſome by that Liquor, and ſome by the Spirit of it. A much ſtranger thing may be ſeen in the Eaſt-India Iſland of *Sombrero*, not very far from *Sumatra*, if we may believe our Countryman Sr *James Lancaſter*, who relates it as an Eye witneſſe, for which reaſon and for the ſtrangeneſſe of the thing, I ſhall adde the ſtory in his own words. *Here* (*ſayes he, ſpeaking of the Coaſt of *Sombrero*) *we found upon the ſand by the Sea ſide, a ſmall Twig growing up to a young Tree, and offering to pluck up the ſame, it ſhrunk down into the ground, and ſinketh, unleſs you hold very hard. And being pluck'd up, a great Worm is the Root of it: and look how the Tree groweth in greatneſſe, the worme diminiſheth. Now as ſoon as the worme is wholly turn'd into the Tree, it rooteth in the ground, and ſo groweth to be great. This Transforma-*

* Purchaſ. Pilgr. part the firſt. p. 152.

tion was one of the greateſt wonders I ſaw in all my Travels. This Tree being plucked up a little, the Leaves ſtripped off and the Pill, by that time it was dry turned into a hard Stone, much like to white Coral; So that (concludes he) *this worme was twice transformed into different natures: of theſe we gather'd and brought home many.* The induſtrious *Piſo*, in his excellent Hiſtory of *Braſil*, vouches a multitude of Witneſſes (not having opportunity to be one himſelf) for the ordinary transformation of a ſort of Animals not much unlike Graſhoppers) into Vegetables, at a certain ſeaſon of the *year.

But ſince I ſate down this Relation of Sr *John Lancaſter*, I have met with another, whoſe ſtrangeneſſe may much countenance it, in a ſmall Tract newly publiſh'd by a Jeſuite, *F. Michael Boym*, whom a good Critick much commended to me. For this Author doth, as an Eye-witneſſe, affirm that which is little leſſe to my preſent Purpoſe. * *Ie vis &c.* i.e. *I ſaw in a ſmall freſh water and ſhallow lake of the Iſland* Hainan, (which belongs to *China*) *Crabs or Crawfiſhes, which, as ſoon as they were drawn out of the water, did in a moment looſe both life and motion, and became petrify'd, though nothing appear'd to*

* The paſſage, which is long, I do not here tranſcribe, having had occaſion to do it elſewhere. It is extant *Lib.* 5. *cap.* 21. and at the cloſe of his Narrative he ſubjoynes, *Non eſt, quod quiſquam de veritate dubitet, cùm infinitos teſtes habeat Braſilia, &c.*

* *Flora Sinenſis, ou Traite des Fleurs &c.* under the Title *Lozmeoques.*

be

be chang'd either in the external or internal figure of their bodies. What he further addes of theſe Fiſhes is but of their virtues in Phyſick, which not concerning our ſubject, I ſhall (*Pyrophilus*) willingly pretermit it; and even, as to our Country-man's relation, hoping, by means of an ingenious Correſpondent in the Eaſt-Indies, to receive a further information about the ſtrange Plant he mentions, I ſhall at preſent urge onely what has been taken notice of concerning Coral, to countenance the Obſervation, for whoſe ſake theſe Narratives have been alledg'd. And ſo likewiſe as to what I was ſaying of Glaſſe and Gunpowder, our receiving of thoſe and the generality of Factitious Bodies into the catalogue of Natural Bodies is not (which I formerly alſo intimated) neceſſary to my preſent Argument: whereto it is ſufficient, that Vitriol is granted on all hands to be a Natural Body, though it be alſo producible by Art. And alſo to the Argument it affords us we might adde that memorable Experiment deliver'd by *Helmont*, of turning oyl of Vitriol into Allom, by the Odour (as he calls it) of Mercury, if, however it be not deſpicable, we had found it fit to be rely'd on. But reſerving an account of that for another place, we ſhall ſubſtitute the inſtance, preſented us by our Author, about the production of Salt-petre: for if, having diſſolv'd Pot-aſhes in fair water, you coagulate the filtrated ſolution into a

white Salt, and on that pour ſpirit of Nitre, till they will not hiſſe any longer, there will ſhoot, when the ſuperfluous water is evaporated, Chryſtals, that proclaim their Nitrous nature by their Priſmatical (or at leaſt Priſme-like) ſhape, their eaſie Fuſion, their Accenſion, and Deflagration, and other qualities, *partly* mention'd by our Author, and *partly* diſcoverable by a little curioſity in making Tryals.

II.

Experimental Attempts about the Redintegration *of Bodies.*

THe former of thoſe two Arguments, (*Pyrophilus*) by which I propoſ'd to confirm the Origine of Forms, was, as you may remember, grounded upon the Manner, by which ſuch a convention of Accidents, as deſerves to paſſe for a Form, may be produc'd: and That having been hitherto proſecuted, it now remains that we proceed to the ſecond Argument, drawn not (as the former) from the firſt Production, but from the Reproduction of a Phyſical Body. And though both theſe arguments are valid; yet if this latter could, in ſpight of the Difficulties intervening in making

king of the Experiments that belong to it, be as clearly made out as the former, you would, I ſuppoſe, like it much the better of the two. For if we could reproduce a Body, which has been depriv'd of its ſubſtantial Form, you would, I preſume, think it highly probable, if not more then probable, that (to borrow our Authors expreſſion) That which is commonly call'd the Form of a Concrete, which gives it its Being and Denomination, and from whence all its qualities are in the vulgar Philoſophy, by I know not what inexplicable wayes, ſuppoſ'd to flow, may be in ſome Bodies but a Characterization or Modification of the Matter they conſiſt of; whoſe parts, by being ſo and ſo diſpoſ'd in relation to each other, conſtitute ſuch a determinate kind of Body, endow'd with ſuch and ſuch properties; whereas, if the ſame parts were otherwiſe diſpoſ'd, they would conſtitute other bodies of very differing natures from that of the Concrete, whoſe parts they formerly were, and which may again reſult or be produc'd after its diſſipation and ſeeming deſtruction, by the reunion of the ſame component particles, aſſociated according to their former diſpoſition.

But though it were not impoſſible to make an adequate Redintegration of a Chymically Analiz'd Body, becauſe ſome of the diſſipated parts will either eſcape through the Junctures of the Veſſels, (though diligently cloſ'd) or,

if they be very ſubtle, will fly away upon the diſjoyning of the Veſſels, or will irrecoverably ſtick to the inſide of them: yet I ſee not, why ſuch a Reproduction, as is very poſſible to be effected, may not ſuffice to manifeſt what we intend to make out by it. For even in ſuch Experiments it appears, that when the Form of a Natural Body is aboliſh'd, and its parts violently ſcatter'd, by the bare Reunion of ſome parts after the former manner, the very ſame Matter the deſtroy'd Body was before made of may, without addition of other Bodies, be brought again to conſtitute a Body of the *like nature* with the former, though not of *equal bulk*. And indeed the Experiment recorded by our Author about the Reproduction of Salt Petre, as it is the beſt and ſucceſsfulleſt I have ever been able to make upon Bodies, that require a ſtrong heat to diſſipate them; ſo I hope it will ſuffice to give you thoſe thoughts about this matter that the Author deſign'd in alledging it; and therefore, though having premiſ'd thus much, I ſhall proceed to acquaint you with the ſucceſſe of ſome Attempts he intimates (in that Eſſay) his intention of making for the Redintegration of ſome Bodies; yet doing it onely out of ſome Hiſtorical Notes I find among my looſe Papers, that which I at preſent pretend to is but *partly* to ſhew you the *difficulty* of ſuch Attempts, which, ſince our Author's Eſſay was communicated, have been repreſen-

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ted (I fear by Conjecture onely) as *very easie* to be accurately enough done; and *partly*, because our Author does not, without reason, intimate the usefulnesse of Redintegrations, in case they can be effected; and does not causelesly intimate, that such Attempts, though they should not perfectly succeed, may increase the number of noble and active Bodies, and consequently, the Inventory of Mankind's Goods.

Upon such considerations we attempted the Dissipation and Reunion of the parts of common Amber; and though Chymists, for fear of breaking their Vessels, are wont, when they commit it to distillation, to adde to it a *caput mortuum* (as they speak) of Sand, Brick, *&c.* (in whose room we sometimes choose to substitute beaten Glasse;) which hinders them to judge of and employ the remanence of the Amber, after the Distillation is finish'd: yet we suppos'd and found, that if the Retort were not too much fill'd, and if the Fire were slowly and warily enough administer'd, the Addition of any other Body would be needlesse. Wherefore having put into a Glasse Retort four or five Ounces of Amber, and administred a gentle and gradual heat, we observ'd the Amber to melt and bubble, (which we therefore mention, because ingenious men have lately questioned, whether it can be melted,) and having ended the Operation and sever'd the vessels, we found, that there was come over in the forme, partly of Oyl, partly of Spirit and

and Flegm, and partly of volatile Salt, near half the weight of the Concrete: and having broken the Retort, we found in the bottom of it a Cake of coal-black Matter, then whose upper surface I scarce remember to have seen in my whole life any thing more exquisitely polish'd; in so much that notwithstanding the Colour, as long as I kept it, it was fit to serve for a Looking-Glasse: and this smooth Masse being broken, (for it was exceeding brittle,) the larger fragments of it appear'd adorn'd with an excellent lustre. All those parts of the Amber, being put together into a Glasse Body, with a blind head luted to it, were placed in Sand, to be incorporated by a gentle heat: but whilst I stept aside to receive a Visit, the Fire having been increas'd without my knowledge, the Fumes ascended so copiously, that they lifted up the Vessel out of the Sand, whereupon falling against the side of the Furnace, it broke at the top, but being seasonably call'd we sav'd all but the Fumes; and the remaining Matter looks not unlike Tarre, and with the least heat may be powr'd out like a Liquor, sticking, even when it is cold, to the fingers. Yet this open'd Body doth not easily communicate so much as a tincture to spirit of Wine, (which therefore seems somewhat strange, because another time presuming, that this would be a good way to obtain a solution of some of the resinous parts of Amber, we did by pouring spirit of Wine, that

(though

though rectify'd) was not of the very best, upon the reunited parts of Amber, lightly digested into a Masse, easily obtain a clear Yellow Solution, very differing from the tincture of Amber, and abounding (as I found by Tryal) in the dissolv'd substance of the Amber: but in Oyl of Turpentine we have, in a short time, dissolv'd it into a bloud red Balsam, which may be of good use (at least) to Chirurgions: And having agen made the former Experiment with more wariness then before, we had the like successe in our Distillation, but, the reunited parts of the Amber being set to digest in a large Bolt head, the Liquor that was drawn off, did in a few hours from its own *Caput mortuum* extract a bloud red Tincture, or else made a Solution of some part of it, whereby it obtain'd a very deep Red; but having been, by intervening Accidents, hindred from finishing the Experiment, we mist the Satisfaction of knowing to what it may be brought at last.

And as for what our Author tels us of this design to attempt the Redintegration of Vitriol, Turpentine, and some other Concretes, wherein it seem'd not unpracticable, he found in it more difficulty then every one would expect. For the Bodies, on which such Experiments are likelieſt to succeed, seem to be Allom, Sea salt, and Vitriol. And as for Allom, he found it a troublesome work to take (as a Spagyrist would speak) the principles of it asunder, in regard, that

that it is inconvenient to diſtill it with a *caput mortuum*, (as Chymiſts call any fix'd Additament) leaſt that ſhould hinder the deſir'd Redintegration of the diſſipated parts: And when he diſtill'd it by its ſelf, without any ſuch Additament, he found, that with a moderate heat the Allom would ſcarce part with any thing but its Phlegm, and if he urg'd it with a ſtrong fire, he found it would ſo ſwell, as to endanger the breaking of the Retort or threaten the boyling over into the Receiver. (Yet having once been able very warily to abſtract as much phlegm and Spirit, as I conveniently could, from a parcel of Roch Allom, and having powr'd it back upon that pulveriz'd *caput mortuum*, and left the veſſel long in a quiet place, I found that the Corpuſcles of the Liquor, having had time, after a multitude of occurſions, to accommodate and reunite themſelves to the more fix'd parts of the Concrete, did by that Aſſociation (or Diſſolution) recompoſe, at the top of the Powder, many Chryſtalline Grains of finely figur'd Salt, which increaſing with time made me hope, that, at the length, the whole or the greateſt part would be reduc'd into Allom, which yet a miſchance, that robb'd me of the Glaſſe, hindred me to ſee.) So likewiſe of Sea ſalt, if it be diſtill'd, as it is uſual, with thrice its weight of burn'd Clay or beaten Brick, twill prove inconvenient in reference to its Redintegration; and if it be diſtill'd alone, it is apt to be fluxt by the heat

heat of the fire, and whilſt it remains in fuſion, will ſcarce yield any Spirit at all. And as for Vitriol, though the Redintegration of it might ſeem to be leſſe hopeful then that of the other Salts, in regard that it conſiſts not onely of a Saline but of a Metalline Body, whence it may be ſuppos'd to be of a more intricate and elaborate Texture: yet becauſe there needs no *caput mortuum* in the Diſtillation of it, we did, to purſue our Author's intimated deſignes, make two or three attempts upon it, and ſeem'd to miſſe of our Aime, rather upon the Account of accidental hinderances, then of any inſuperable difficulty in the thing it ſelf. For once, we with a ſtrong fire drew off from a parcel of common blew Vitriol the Phlegm and Spirit, and ſome quantity of the heavy Oyl; (as Chymiſts abuſively call it:) theſe Liquors, as they came over without Separation, we divided into ſeveral parts, and the remaining very red *Caput mortuum* into as many. One of theſe parcels of Liquor we poured over night upon its correſpondent portion of the newly mentioned red Powder. But having left it in a Window, and the Night proving very bitter, in the morning I found the Glaſſe crack'd in many places by the violence of the Froſt, and the Liquor ſeem'd to have been ſoak'd up by the Powder, and to have very much ſwelled it. This mixture then I took out, and placing it in an open mouth'd Glaſſe in a Window, I found, after a while, di-

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vers grains of pure Vitriol upon the other Matter, and some little swellings, not unlike those we shall presently have occasion to speak of. I took likewise a much larger parcel of the forementioned Liquor, and its correspondent proportion of *Caput mortuum*; and having leisurely mixt them in a large Glasse Bason, I obtain'd divers *Phænomena*, that belong not to this place, but may be met with, where they will more properly fall in. In this Bason (which I lay'd in the Window and kept from Agitation,) I perceived, after a while, the Liquor to acquire a blewish Tincture, and after ten or twelve weeks, I found the mixture dry, (for, it seems, it was too much exposed to the Air:) but the Surface of it adorn'd in divers places with grains of Vitriol very curiously figur'd. And besides these, there were store of protuberances, which consisted of a boundance of small Vitriolate particles, which seem'd in the way to a Coalition; for having let the Bason alone for four or five months longer, the Matter appear'd crusted over, partly with very elevated Saline protuberances, partly with lesser parcels, and partly also with considerably broad cakes of Vitriol, some of above half an Inch in breadth, and proportionably long; and indeed the whole surface was so odly diversifi'd, that I cannot count the trouble, these Tryals have put me to, mispent. Another time in a more slender and narrow mouth'd Glasse I pour'd back upon the *Caput*

mortuum

mortuum of Vitriol the Liquors, I had by violence of the fire forc'd from it; ſo that the Liquid part did ſwim a pretty height above the red *Calx*, and remain'd a while limpid and colourleſſe: but the veſſel having ſtood, for ſome time, unſtop'd in a Window, the Liquor after a while acquir'd by degrees a very deep vitriolate colour, and not long after there appear'd, at the bottome and on the top of the *Calx*, many fair and exquiſitely figur'd grains of Vitriol, which cover'd the ſurface of the *Calx*; and the longer the veſſel continu'd in the window, the deeper did this change, made upon the upper part of the Powder, ſeem to penetrate: ſo that I began to hope, that, in proceſs of time, almoſt (if not more then almoſt) the whole mixture would be reduc'd to perfect Vitriol. But an Accident robb'd me of my Glaſſe, before I could ſee the utmoſt of the Event.

And, on this Occaſion, I muſt not pretermit an odde Experiment I lately made, though I dare not undertake to make it agen. I elſewhere relate, how I digeſted, for divers weeks, a quantity of powder'd Antimony, with a greater weight by half of Oyl of Vitriol; and how having at length committed this mixture to Diſtillation, and thereby obtained, beſides a little Liquor, a pretty quantity of combuſtible Antimonial or Antimonio-Vitriolate Sulphur; there remained, in the bottome of the Retort, a ſomewhat light and very friable *Caput mortuum*, all the

the upper part of which was at leaſt as white as common Woodaſhes, and the reſt look'd like a Cinder. And now I muſt tell you what became of this *Caput mortuum*, whereof I there make no further mention. We could not well foreſee what could be made of it, but very probable it was, that it would afford us ſome new diſcovery, by being expoſed to the fire, in regard of the copious Sulphur, whereof it ſeem'd to have been deprived: provided it were urg'd in cloſe Veſſels, where nothing could be loſt. Whereupon committing it to a naked fire in a ſmall glaſſe Retort, well Coated and accommodated with a Receiver, we kept it there many hours, and at length ſevering the Veſſels, we found (which need not be wonder'd at) no Antimonial Quick-ſilver, and much leſſe of Sulphur ſublim'd then we expected: wherefore greedily haſtning to the *Caput mortuum*, we found it flux'd into a Maſſe, covered with a thin cake of Glaſſe; whoſe fragments being held againſt the light were not all coloured, as Antimonial Glaſſe is wont to be, but were as colourleſſe as common white Glaſſe. The Lump above mentioned being broken was found, ſomewhat to our wonder, to be perfect black Antimony, adorn'd with long ſhining ſtreaks, as common Antimony is wont to be: onely this Antimony ſeem'd to have been a little refin'd by the ſequeſtration of its unneceſſary Sulphur; which Ingredient ſeems by this Experiment,

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as well as by some other Observations of ours, to be more copious in some particular parcels of that Mineral, then is absolutely requisite to the constitution of Antimony. Though in our case it *may* be suspected, that the reduction of part of the Masse to a colourlesse Glasse was an effect of the absence of so much of the Sulphur, and might *in part* make the remaining mass some amends for it. What we further did with this new or reproduced Concrete is not proper to be here told you: onely, for your satisfaction, we have kept a lump of it, that you may with us take notice of what some Philosophers would call the Mindfulnesse of Nature, which, when a Body was deprived of a not inconsiderable portion of its chief ingredient, and had all its other parts dissipated and shuffled and discolour'd, so as not to be knowable, was able to rally those scatter'd and disguised parts, and marshal or dispose them into a body of the former consistence, colour, &c. though (which is not here to be overlook'd) the contexture of Antimony, by reason of the copious shining *Striæ*, that enoble the darker Body, be much more elaborate, and therefore more uneasie to be restored then that of many other Concretes.

But among all my Tryals about the Redintegration of Bodies, that which seem'd to succeed best, was made upon Turpentine: for having taken some ounces of this, very pure and good, and put it into a Glass Retort, I distill'd

ſo long with a very gentle fire, till I had ſepa-rated it into a good quantity of very clear liquor, and a *Caput mortuum* very dry and brittle: then breaking the Retort I powder'd the *caput mortuum*, which, when it was taken out, was exceeding ſleek, and tranſparent enough, and very red, but being powder'd, appear'd of a pure yellow colour. This powder I carefully mixt with the liquor that had been diſtill'd from it, which immediately diſſolv'd part of it into a deep red balſame, but by further digeſtion in a large Glaſſe exquiſitely ſtopt, that colour began to grow fainter, though the remaining part of the powder, (except a very little, proportionable to ſo much of the liquor, as may be ſuppoſ'd to have been waſted by evaporation and transfuſion out of one veſſel into another,) be perfectly diſſolv'd, and ſo well reunited to the more fugitive parts of the Concrete, that there is ſcarce any, that by the ſmell or taſt or conſiſtence would take it for other then good and laudable Turpentine.

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CONSIDERATIONS and EXPERIMENTS, Touching the *Origine of* *QUALITIES and FORMES:*

THE HISTORICAL PART.

THE I. SECTION.

The I. SECTION, containing the OBSERVATIONS.

IN the foregoing Notes I have endeavoured with as much clearneſſe as the difficulty of the Subject and the Brevity I was confined to permitted, to give a Scheme or ſummary of the principles of the Corpuſcularian Philoſophy, as I apprehended them, by way of a ſhort Introduction to it, at leaſt as far as I judged it neceſſary for the better underſtanding of what is contain'd in our Notes and Experiments concerning the productions and changes of particular Qualities. But though, I hope, I have not ſo affected brevity as to fall into obſcurity, yet ſince theſe principles are built upon the *Phænomena* of Nature, and deviſ'd in order to the Explication of them, I know not what I can do more proper to recommend them, then to ſubjoyn ſome ſuch Natural *Phænomena*, as either induce me to take up ſuch Notions, or which I was directed to find out by the notions I had imbrac'd. And ſince I appeal to the teſtimony of Nature to verifie the doctrine I have been propoſing about the Origine and pro-

duction of Qualities, (for that of Formes will require a distinct discourse,) I think it very proper to set down some Observations of what Nature does, without being over-rul'd by the power and skill of man, as well as some Experiments wherein Nature is guided and as it were master'd by Art, that so she may be made to attest the truth of our Doctrine, as well when she discloses her self freely, and, if I may so speak, of her own accord, as when she is as it were cited to make her Depositions by the industry of Man. The Observations will be but the more suitable to our Design for being common and familiar as to the *Phænomena*, though perhaps new enough as to the application to our purpose. And as for the Experiments, because those that belong more immediately to this or that particular Quality may be met with in the Notes that treat of it, I thought it not amisse that the Experiments should be both few in number, and yet so pregnant, that every one of them should afford such differing *Phænomena*, as may make it applicable to more then one Quality.

I.

The Observation I will begin with shall be fetcht from what happens in the Hatching of an Egge. For as familiar and obvious a thing as it is, (especially after what the Learned *Fabricius ab Aquâ pendente*, and a recenter

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Anatomiſt have delivered about them,) that there is a great change made in the ſubſtance of the Egge, when tis by incubation turn'd into a Chick: yet, as far as I know, this change hath not been taken notice of for the ſame purpoſe to which I am about to apply it.

I conſider then, that in a prolifick Egge, (for inſtance that of a Hen,) as well the liquor of the Yolk as that of the White is a ſubſtance, as to ſence, ſimilar. For upon the ſame account that Anatomiſts and Phyſicians call ſeveral parts of the humane body, as bones, membranes, &c. ſimilar, that is ſuch, as that every ſenſible part of it hath the ſame nature or denomination with the whole, as every ſplinter of bone is bone, as every ſhred of skin is skin.

And though I find by diſtilling the Yolks and Whites they ſeem to be diſſimilar bodies, in regard that the White of an Egge (for Example) will afford ſubſtances of a very differing nature, as Flegme, Salt, Oyl, and Earth, yet (not now to examine whether, or how far theſe may be eſteem'd productions of the Fire, that are rather obtain'd from the white of the Egge, then were præexiſtent in it; not to mention this I ſay,) it doth not appear by Diſtillation, that the white of an Egge is other then a ſimilar Body in the ſenſe above deliver'd. For it would be hard to prove, that one part of the White of an Egge will not be made

to yield the same differing Substances by Distillation, that any other part does; and Bones themselves and other hard parts of a humane Body, that are confessedly Similar, may by Distillation be made to afford Salt, and Phlegme, and Spirit, and Oyl, and Earth, as well as the White of an Egge.

This being thus setled in the First place, we may in the Next consider, that by beating the White of an Egge well with a Whisk, you may reduce it from a somewhat Tenacious into a Fluid Body, though this Production of a Liquor be, as we elsewhere noted, effected by a Divulsion, Agitation *&c.* of the parts, that is in a word, by a Mechanical change of the Texture of the Body.

In the Third place I consider, that according to the exactest Observations of Modern Anatomists, which our own Observations do not contradict, the Rudiments of the Chick, lodg'd in the *Cicatricula* or white Speck upon the Coat of the Yolk, is nourish'd, till it have obtain'd to be a great Chick, onely by the White of the Egg; the Yolk being by the Providence of Nature reserv'd as a more strong and solid Aliment, till the Chick have absum'd the White, and be thereby grown great and strong enough to digest the Yolk; and in effect you may see the Chick furnish'd not only with all the necessary, but divers other parts, as Head, Wings, Legs, and Beak, and Claws, whilst the Yolke

seems

ſeems yet as it were untouch'd. But whether this Obſervation about the Entireneſſe of the Yolk be preciſely true, is not much material to our preſent purpoſe, nor would I be thought to build much upon it; ſince the Yolk it ſelf, eſpecially at that time, is wont to be fluid enough, and to be a Liquor perhaps no leſſe ſo then the White was, and That is enough for my preſent purpoſe.

For in the Laſt place I conſider, that the Nutritive Liquor of an Egge, which is in it ſelf a body ſo very ſoft, that by a little Agitation it may be made Fluid, and is readily enough diſſolvable in common cold water, this very Subſtance, I ſay, being brooded on by the Hen, will within two or three weeks be tranſmuted into a Chick, furniſh'd with Organical parts, as Eyes, Ears, Wings, Legs, *&c.* of a very differing fabrick, and with a good number of ſimilar ones, as Bones, Cartilages, Ligaments, Tendons, Membranes, *&c.* which differ very much in Texture from one another; beſides the Liquors, as Blood, Chyle, Gall, *&c.* contain'd in the ſolid parts: So that here we have out of the White of an Egge, which is a Subſtance Similar, Inſipid, Soft, (not to call it Fluid,) Diaphanous, Colourleſſe, and readily diſſoluble in cold water, out of this Subſtance I ſay, we have by the new and various Contrivement of the ſmall parts it conſiſted of, an Animal, ſome of whoſe parts are not Tranſparent but Opacous; ſome of them Red,

Red, as the Bloud; ſome Yellow or Greeniſh, as the Gall; ſome White, as the Brain; ſome Fluid, as the Bloud, and other Juices; ſome Conſiſtent, as the Bones, Fleſh, and other ſtable parts of the Body; ſome Solid and Frangible, as the Bones, others Tough and Flexible, as the Ligaments, others Soft and looſly Coherent, as the Marrow; ſome without Springs, as many of the parts; ſome with Springs, as the Feathers; ſome apt to mingle readily with cold water, as the Bloud, the Gall; ſome not to be ſo diſſolv'd in it, as the Bones, the Claws, and the Feathers; ſome well taſted, as the Fleſh and Bloud; ſome very ill taſted, as the Gall; (for That I have purpoſely and particularly obſerv'd.) In a word, we have here produc'd out of ſuch an uniforme Matter as the White of an Egge,

. Firſt, new kind of Qualities, as (beſides Opacity) Colours, (whereof a ſingle Feather will ſometimes afford us Variety,) Odours, Taſts, and Heat in the Heart and Bloud of the Chick, Hardneſſe, Smoothneſſe, Roughneſſe, *&c.*

Secondly, diverſe other Qualities, that are wont to be diſtinguiſh'd from Senſible ones, as Fluidity (in the Bloud and aqueous humor of the Eye,) Conſiſtency in the Griſles, Fleſh, *&c.* Hardneſſe, Flexibility, Springyneſſe, Toughneſſe, unfitneſſe to be diſſolv'd in cold water, and ſeveral others. To which may probably be added

Thirdly,

Thirdly, ſome occult Properties, as Phyſicians obſerve, that ſome Birds, as young Swallows, young Magpies afford Specifick or at leaſt Noble Medicines in the Falling ſickneſſe, Hyſtericall Fits, and divers other Diſtempers.

Fourthly, I very well foreſee it may be objected, that the Chick with all its parts is not a Mechanically contriv'd Engine, but faſhion'd out of Matter by the Soul of the Bird, lodg'd chiefly in the *Cicatricula* which by its Plaſtick power faſhions the obſequious Matter, and becomes the Architect of its own manſion. But not here to examine, whether any Animal, except Man, be other then a Curious Engine, I anſwer, that this Objection invalidates not what I intend to prove from the alledg'd Example. For let the Plaſtick Principle be what it will, yet ſtill, being a Phyſical Agent, it muſt act after a Phyſical manner, and having no other Matter to work upon but the White of the Egge, it can work upon that Matter but as Phyſical Agents, and conſequently can but divide the Matter into minute parts of ſeveral Sizes and Shapes, and by Local Motion variouſly context them, according to the Exigency of the Animal to be produc'd, though from ſo many various Textures of the produc'd parts there muſt naturally emerge ſuch differences of Colours, Taſts, and Conſiſtencies, and other Qualities as we have been taking notice of. That which we are here

to

to consider, is not what is the Agent or Efficient in these Productions, but what is done to the Matter to effect them. And though some Birds by an inbred Skill do very Artificially build their curious Nests, yet cannot Nature, that teaches them, enable them to do any more then select the Materials of their Nests, and by Local Motion divide, transport, and connect them after a Certain manner. And when Man himself, who is undoubtedly an Intelligent Agent, is to frame a building or an Engine, he may indeed by the help of Reason and Art, contrive his Materials curiously and skilfully, but still all he can do, is but to move, divide, transpose, and context the several parts, into which he is able to reduce the Matter assign'd him.

Nor need we imagine, that the Soul of that Hen, which having first produc'd the Egge does after a while sit on it, hath any peculiar Efficiency in hatching of a Chick: for the Egge will be well hatch'd by another Hen, though That which laid it be dead; and, which is more, we are assur'd by the Testimony of very good Authors, as well as of recent Travellers, that in some places, especially in *Ægypt*, there needs no Bird at all to the Production of a Chick out of an Egge, since they hatch multitudes of Eggs by the regulated heat of Ovens or Dunghils. And indeed that there is a Motion or Agitation of the parts of the Egge by the external heat, whereby

whereby it is hatch'd is evident of its ſelfe, and not (as farre as I know) deny'd by any, and that alſo the white Subſtance is abſumed and contexted or contriv'd into the Body of the Chick and its ſeveral parts, is manifeſt to ſenſe; eſpecially if one hath the Curioſity to obſerve the progreſſe of the Chicks formation and increment. But as 'tis evident, that as theſe two things, the Subſtance of the White, and the Local Motion, wherein the external Heat neceſſary to Incubation puts its parts, do eminently concurre to the production of the Chick, ſo that the Formative power (whatever that be) doth any more then guide theſe Motions, and thereby aſſociate the fitted Particles of Matter after the manner requiſite to conſtitute a Chick, is that which I think will not eaſily be evinc'd. And I might to what I ſaid of the Egge, adde ſeveral things touching the Generation of Viviparous Animals, which the Learned *Fabricius ab Aqua pendente*, as well as ſome of the Antient Philoſophers, would have to be generated from an imperfect kind of Eggs: but I take the Eggs of Birds to be much fitter to inſtance in, becauſe they are things that we have more at command, and wherewith we can conveniently make more Trials and Obſervations; and eſpecially becauſe in perfect Eggs the Matter to be tranſmuted is more cloſely lock'd up, and being kept from any viſible ſupply of Matter, confin'd to be wrought upon by the External Heat, and by its own Vital Principle within.

II. Water

II.

Water being generally esteem'd an Elementary Body, and being at least farre more Homogeneous then Bodies here below are wont to be; it may make very much for our present purpose to shew, that Water it self, that is Fluid, Tastlesse, Inodorous, Diaphanous, Colourless, Volatile, *&c.* may, by a differing Texture of its Parts, be brought to constitute Bodies of Attributes very distant from these. This I thought might be done, by nourishing Vegetables with simple water. For in case I could do so, all or the greatest part of that which would accrue to the Vegetable thus nourish'd would appear to have been materially but Water, with what Exotick Quality soever it may afterwards, when transmuted, be endow'd.

The Ingenious *Helmont* indeed mentions an Experiment somewhat of this nature, though not to the same purpose, which he made by planting a Branch of Willow into a pot full of earth, and observing the increase of weight he obtain'd after divers years, though he fed the Plant but with Rain water. And some Learned Modern Naturalists have conjectur'd at the easy transmutableness of Water by what happens in Gardens and Orchards, where the same Showers or Rain after a long drought makes a great

great number of differing Plants to flouriſh. But though theſe things be worthy of their Authors, yet I thought they would not be ſo fit for my purpoſe, becauſe it may be ſpecioufly enough objected, that the Rain water does not make theſe Plants thrive and flouriſh, by immediately affording them the Aliments they aſſimilate into their own Subſtance, but by proving a Vehicle, that diſſoves the Saline, and other Alimental Subſtances of the Earth, and dilutes both them and the nutritive Juice, which, in a part of the Plant its ſelf, it may find too much thickned by the drought or heat of the ambient Air, and by this means it contributes to the nouriſhment of the Plant, though it ſelf be inſenſibly afterwards exhal'd into vapours. And indeed Experience ſhews us, that ſeverall Plants, that thrive not well without Rain water, are not yet nouriſh'd by it alone, ſince when Corn in the Field and Fruit-trees in Orchards have conſum'd the Saline and Sulphureous Juices of the Earth, they will not proſper there, how much Rain ſoever falls upon the Land, till the Ground by Dung or otherwiſe be ſupply'd again with ſuch aſſimilable juices. Wherefore I rather choſe to attempt the making of Plants grow in Viols fill'd with Water, not onely to prevent the forementioned Objection, and alſo to make the Experiment leſſe tedious, but that I might have the pleaſure of ſeeing the progreſſe of Nature in the Tranſmutation of Water; and my

Obſervations

Observations of this kind as Novelties, unmention'd by any other Writer, I shew'd divers ingenious Friends, who having better opportunities then I of staying in one place, have attempted the like, and made successful trials, which I suppose will not be conceal'd from the publick. Of my Observations about things of this kind, I can at present find but few among my *Adversaria*, but in them I find enough for my present turn. For they and my memory inform me, that *Vinca Pervinca*, *Raphanus Aquaticus*, Spearmint, and even *Ranunculus* it self, did grow and prosper very well in Viols fill'd with fair water, by whose necks the leaves were supported, and the Plant kept from sinking: some of these were only Cuttings without roots, diverse of them were left in the water all the Autumne, and great part of the Winter, and at the end of January were taken out verdant, and with fair roots, which they had shot in the water. And besides I find, that particularly a branch or sprig of *Raphanus Aquaticus* was kept full nine months, and during that time wither'd not the whole winter, and was taken out of the water with many fibrous roots, and some green buds, and an increase of weight, and that a stump of *Ranunculus* did so prosper in the water, that in a months time it had attain'd to a pretty deale more then double the weight it had when it was put in. And the next note which I find concerning these Plants, informes me, that the above

bove mention'd Crowsfoot being taken out *agen* at six months after it was put in weigh'd a Drachm and a half wanting a Grain and a half, that is, somewhat above thrice as much as it did at first. This last Circumstance (of the increase of weight) I therefore thought fit particularly to make tryal of, and set down upon this account among others, that having doubted the Roots and Leaves, that seem'd produc'd out of the water, might really be so by an oblongation and an expansion of the Plants, (as I have purposely try'd, that an Onion weigh'd and laid up in the Spring, though after some weeks keeping in the Air it shot Blades, whereof one was five inches long, in stead of incorporating the Air or terrestrial *Effluviums* with it self, and consequently thereby growing heavier, had lost nine Grains of its former weight;) it might by this circumstance appear, that there may be a real assimilation and transmutation of Water into the substance of the Vegetable, as I elsewhere also shew by other proofs. For this being made out, from thence I infer, that the same Corpuscles, which, convening together after one manner, compose that fluid, inodorous, colourless, and insipid body of water, being contexted after other manners, may constitute differing Concretes, which may have Firmness, Opacity, Odours, Smels, Tasts, Colours, and several other manifest qualities, and that too very different from one another.

And beſides all this, theſe diſtinct portions of tranſmuted Water may have many other qualities, without excepting thoſe that are wont to be call'd Specifick or occult, witneſſe the ſeveral Medicinal virtues attributed by Authors to Spearmint, and to Periwinckle, to Majorane, and to *Raphanus Aquaticus*. And as for *Ranunculus*, that Plant being reckoned among Poiſonous ones and among thoſe that raiſe Bliſters, twill be eaſily granted, that it hath, as other poiſons, an occult deleterial faculty; and indeed it ſomewhat deſerves our wonder, that ſo inſipid and innocent a thing as fair water ſhould be capable to be turn'd into a ſubſtance of ſuch a piercing and cauſtick nature, as by contact to raiſe Bliſters on an humane Body. And yet perhaps that is no leſſe ſtrange, which we elſewhere relate, that a Plant, conſiſting chiefly of tranſmuted water, did by diſtillation afford us a true oyl, that would not mingle with water, and conſequently was eaſily convertible into Fire. But whether or no this Experiment or any ſuch like prove, that almoſt all things may be made of all things, not immediately, but by intervention of ſucceſſive changes and diſpoſitions, is a queſtion to which we elſewhere ſay ſomething, but are not willing in this place to ſay any thing. And if it be here objected, that the ſolid Subſtance, that accrues to a Plant rooted in water, proceeds not at all from the water it ſelf, but from the Nitrous, fat, and earthy ſubſtances, that may be preſum'd to abound even in com-

mon water, not here to repeat what I elſewhere ſay about this Objection, I ſhall at preſent reply, that though as to diverſe Plants that flouriſh after rain I am apt to think, as I intimated above, that they may in part be nouriſh'd as well by the Saline and Earthy ſubſtances, to which the rain uſually proves a vehicle, as by the Rain it ſelf; yet as to what the Objection holds forth about the Plants that grow not in the ground, but in glaſſes fill'd with water, it ſhould not be barely ſaid but prov'd, which he will not perhaps think eaſie to be done, that conſiders how vaſt a quantity of fair water is requiſite to be exhal'd away, to obtain as much as one ounce of dry reſidence whether ſaline or earthy.

III.

That a Plant growing in the Earth doth by the faculties of its Vegetative ſoul attract the juices of the Earth, that are within its reach, and ſelecting thoſe parts that are congruous to its nature refuſe the reſt, is the general opinion of Philoſophers and Phyſicians: and therefore many Naturaliſts are not wont much to marvail, when they ſee a Tree bear a fruit that is ſowr or bitter, becauſe they preſume, that Nature hath in the root of the tree cull'd out ſuch parts of the Alimental juice of the Earth, as being made to convene into one fruit are fit to make it of ſuch a quality. But tis worth obſerving for our preſent purpoſe what happens both in ordinary graftings, and eſpecially in that kind of

inſition (taking the word in a large ſenſe) which is commonly call'd Inoculation. For though we may preſume, that the root of a white Thorne (for inſtance) may elective attract its Aliment from the Earth, and chooſe that which is fitteſt to produce the ignoble fruit that is proper for that Plant: yet we cannot reaſonably ſuppoſe, that it ſhould in its attraction of aliment have any deſign of providing an appropriate nutriment for a Pear, and yet the known experience of Gardiners and our own Obſervations manifeſt, that the Cyons of a Pear tree will take very well upon a white thorn ſtock, and bring forth a well taſted fruit, very differing in many qualities from that of the white thorn. I have alſo learn'd from thoſe that are expert, that though Apples and Peares, being but vulgar fruit, are ſeldome propagated but by Grafting; yet they may be propagated likewiſe by Inoculation; (which ſeems to be but a kind of Grafting with a bud.) Now in the Inoculations that are made upon fruit-trees, tis very obſervable, and may much countenance what we are endeavouring to prove, that a little Vegetable bud, (that is no ſeed properly ſo call'd) not ſo big oftentimes as a Pea, ſhould be able ſo to tranſmute all the Sap that arrives at it, that though this Sap be already in the Root, and in its paſſage upwards determin'd by Natures intention, as men are wont to ſpeak, to the production of the fruit that is natural to the

the Stock; yet this ſap ſhould by ſo ſmall a vegetable ſubſtance as a Bud, (whether by the help of ſome peculiar kind of Strainer, or by the operation of ſome powerful Ferment lodg'd in it, or by both theſe, or ſome other cauſe) be ſo far chang'd and over-rul'd, as to conſtitute a fruit quite otherwiſe qualify'd then that which is the genuine production of the Tree, and which is actually produc'd by thoſe other portions of the like Sap, which happen'd to nouriſh the prolifick Buds, that are the genuine of-ſpring of the ſtock; ſo that the ſame Sap, that in one part of a branch conſtitutes (for inſtance) a cluſter of Haws, in another part of the ſame Branch may conſtitute a Pear. And that which is further remarkable to our preſent purpoſe is, that not onely the fruits made of the ſame Sap do often differ from one another in ſhape, bigneſſe, colour, odour, taſt, and other obvious qualities, as well as occult ones: but that though the Sap it ſelf be (oftentimes) a wateriſh and almoſt inſipid liquor, that appears to ſenſe Homogeneous enough, and even by Diſtillation affords very little beſides Phlegm; yet this Sap is not onely convertible by Buds of ſeveral natures into differing fruits, but in one & the ſame fruit the tranſmuted Sap ſhall by differing textures be made to exhibit very differing & ſometimes contrary qualities. As when (for inſtance) a Peach bud does not only change the Sap that comes to it into a fruit, very differing from that which the Stock naturally pro-

duceth, but in the skin of the Peach it must be red, in the Kernel white, and in other parts of other colours; the flesh of it must be fragrant, the stone inodorous, the flesh soft and yielding, the stone very hard and brittle, the meat pleasantly tasted, the kernel bitter; not to mention, that Peach blossoms, though produc'd also by the Bud, are of a colour and texture very differing from that of the Fruit, and are ennobled with an Occult quality, which the Fruit hath not, I mean a Purgative virtue: So that from Inoculations we may learn, that a phlegmatick Liquor, that seems Homogeneous enough, and but very slenderly provided with other manifest qualities then common water, may, by being variously contexted by the Buds of trees, be transmuted into Bodies endow'd with new and various and considerable Sents, Colours, Tasts, Solidity, Medicinal virtues, and diverse other Qualities manifest and occult.

If it be here said, that these Qualities are the productions of the Plastick power residing in prolifick Buds, which indeed (to me) seem to be but very minute Boughs; I shall return the same Answer that I did to the like objection, when twas propos'd in the first Observation.

Hitherto I have onely argued from vulgar Inoculations, but there may be others, as well more considerable, as lesse ordinary; and I remember I have seen a Tree, whereof, though the Stock was of one sort of good fruit, there were

were three more and differing kinds of Stone-fruit, that had been made to take by Inoculation; and two of those inoculated Boughs had actually fruit on them, and the third, though it had as yet no fruit, because the season for that sort of Plants to bear was not yet come, yet the Shoot was so flourishing, that we concluded, that the Blossoms would in due time be succeeded by fruit. And since I have been speaking of the differing qualities of the parts of the same fruit, I am content to adde two things: the one that *Garcias ab Horto*, a Classick Author, (and Physician to the Indian Viceroy) affirms* with some solemnity, (as wondring that a learned man should write otherwise) that though the fruit we call *Cassia fistula* be very commonly us'd, both here and in the *Indies* as a purging Medicine, yet the seeds of this Solutive *Cassia* are astringent. The other that of late years there have been often brought into England from the *Caribbe* Islands certain Kernels of a fruit, which those that have seen it grow liken to a white Pear-plum; these are so strongly Purgative and also Emetick, that the ingenious Mr. *Lygon* * tells us, that five of them wrought with him a dozen times upwards, and above twenty downwards, and yet the same Author assures us, (which is likewise here a receiv'd tradition among them that are curious of

* *Aromat. Hist. lib. 1. cap. 29. de Cassia solutiva.*
* Lygon's *History of Barbados. pag.* 67, 68.

this fruit,) that in the Kernel, in the parting of it into halfes, (as when our Hazie Nuts in *England* part in the middle longwiſe) you ſhall find a thin filme, which looks of a faint Carnation, (which colour is eaſily enough diſcerned, the reſt of the Kernel being perfectly white,) and that taking out the Filme you may eat the Nut ſafely, without feeling any operation at all, and tis as ſweet as a Jordan Almond. [A learned man, that practiſ'd Phyſick in *America*, being enquir'd of by me concerning the truth of this Relation, anſwer'd, that though he had diverſe times given thoſe Nuts as Cathartick remedies, yet he had not that curioſity to take out the Filmes, finding it the univerſal beliefe, that the Purgative faculty conſiſted therein.] And I remember, that the famous * *Monardes* doth ſomewhat countenance this Tradition, where ſpeaking of another purging fruit that alſo comes from *America*, (from *Cartagena*, and *Nombre de Dios*) he takes notice, that theſe purging Beans (which are like ours, but ſmaller) have a thin skin, that divides them through the middle, which muſt (together with the external Rind) be caſt away, elſe they will work ſo violently both upwards and downwards, as to bring the Taker into hazard of his life: whereas he commends theſe Beans rightly prepar'd not onely as a pleaſant Medicine, that doth without trouble purge both Choler, Phlegm, & groſs

* See *Nicholaus Monardes* under the title, *Fabæ purgatrices.*

Hu-

Humors, for which it is celebrated among the *Indians.*

To theſe ſtories of our Countrymen and *Monardes* I ſhall ſubjoin another, which I find related by that great Rambler about the World, *Vincent le Blanck*, who giving us an Account of a publick Garden, which he viſited in *Africa*, in the Territories of the Lord of *Caſima*, not far from the Borders of *Nubia*, which he repreſents as the curioſeſt Garden he ſaw in all the Eaſt, he mentions this among other Rarities, "There were (ſayes he) other ſorts of Fruit, which I never ſaw but there, and one among the reſt leav'd like a Sycamore, with fruit like the Golden Apple, but no Gall more bitter, and within five Kernels, as big as Almonds, the Juice whereof is ſweet as Sugar, betwixt the Shell and the Nut there grows a thick Skin of a Carnation colour, which taken before they be throughly ripe, they preſerve with Date Vinegar, and make an excellent Sweetmeat, which they preſent to the King as a great Curioſity.

IV.

The Fourth and laſt Obſervation I ſhall at preſent mention is afforded me by the conſideration of Rotten Cheeſe. For if we take notice of the difference betwixt two parts of the ſame Cheeſe, whereof the one continues ſound by preſerving its Texture, and the other hath ſuffer'd

ſuffer'd that Impairing Alteration of Texture we call Rottenneſſe, we may often ſee a manifeſt and notable change in the ſeveral portions of a Body, that was before Similar. For the Rotten part will differ from the Sound in its *Colour*, which will be ſometimes Livid, but moſt commonly betwixt Green and Blew, and its *Odour*, which will be both ſtrong and offenſive, and its *Taſt*, which will be very Picquant, and to ſome men much more pleaſant then before, but to moſt men odious; and in divers other Qualities, as particularly its *Conſiſtence*, it will be much leſſe Solid and more Friable then before; and if with a good Microſcope we look upon the moulded parts of many Cheeſes, we ſhall quickly diſcover therein ſome Swarms of little Animals, (the Mites) furniſh'd with *variety* of Parts of differing Sizes, Shapes, Textures, *&c.* and deſcry a yet greater diverſity, both as to manifeſt Qualities (nor probably is it inferior as to Occult ones) betwixt the mouldy part of the Cheeſe and the untainted, then the unaſſiſted Eye could otherwiſe have diſcovered.

ADVERTISEMENTS about the enſuing II. *SECTION.*

THE Author would not have the Reader think, that the following Experiments are the ſole ones that he could have ſet down to the ſame purpoſe with them. For they are not the onely that he had actually laid aſide for this occaſion, till judging the enſuing ones ſufficient for his preſent ſcope, he thought it fitter to reſerve others for thoſe Notes *about the Production of particular Qualities, to which they ſeem'd properly to belong. Perhaps alſo it will be requiſite for me (becauſe ſome Readers may think the Omiſſion a little ſtrange) to excuſe my having left divers particulars unmentioned in more then One of the enſuing Experiments. And I confeſe that I might eaſily enough both have taken notice of more Circumſtances in them, and made far more reflexions on them, if I would have exſpatiated on the ſeveral Experiments according to the Directions deliver'd in other* Papers. But though* there, *where twas my Deſign to give imployment to the Curioſity and Diligence of as many Votaries to Nature, as (for want of better inſtructions) had a mind to be* ſo

* Containing ſome Advices and Directions for the writing of an Experimental Natural Hiſtory.

ſet

ſet on work, it was fit the propoſed Method ſhould be ſuitable; yet here, *where I deliver Experiments not ſo much as part of Natural Hiſtory as inſtances to confirm the* Hypotheſes *and Diſcourſes they are annexed to; it ſeemed needleſſe and improper (if not impertinent) to ſet down Circumſtances, Cautions, Inferences, Hints, Applications, and other Particulars, that had no tendency to the ſcope, for which the Experiments were alledged.*

*And as for the kind of Experiments here made choice of, I have the leſſe ſcrupled to pitch upon Chymical Experiments rather then others on this occaſion; not onely becauſe of thoſe Advantages which I have aſcrib'd to ſuch Experiments in the latter part of the Preface * to my* Specimens, *but becauſe I have been encouraged by the ſucceſſe of the Attempt made in thoſe Diſcourſes. For as new as it was when I made it four or five years ago, and as unuſual a thing as it could ſeem to divers Atomiſts and Carteſians, that I ſhould take upon me to Confirm and Illuſtrate the Notions of the Particularian Philoſophy (if I may ſo call it) by the help of an Art, which many were pleas'd to think cultivated but by illiterate Operators or Whymſical Phanaticks in Philoſophy, and uſeful onely to make Medicines or Diſguize Metals: yet theſe Endeavours of ours met with*

* The Preface here mentioned is that premiſed to the Tract intitled —— *Some Specimens of an Attempt to make Chymical Experiments uſeful to illuſtrate the Notions of the Corpuſcular Philoſophy.*

much

much leſſe oppoſition, then new Attempts are moſt commonly fain to ſtruggle with. And in ſo ſhort a time I have had the happineſſe to engage both divers Chymiſts to learn and reliſh the Notions of the Corpuſcular Philoſophy, and divers eminent Embracers of That to endeavour to illuſtrate and promote the New Philoſophy, by addicting themſelves to the Experiments, and peruſing the Books of Chymiſts. And I acknowledge, it is not unwelcome to me to have been (in ſome little meaſure) inſtrumental to make the Corpuſcularian Philoſophy aſſiſted by Chymiſtry *preferred to that which has ſo long obtained in the Schools. For (not here to conſider, which I elſewhere do, how great an Advantage that Philoſophy hath of This, by having an advantage of it in point of clearneſſe) though divers Learned and worthy men that knew no better Principles, have, in cultivating the Peripatetick Ones, abundantly exerciſed and diſplaid their own Wit: yet I fear they have very little, if at all, improved their Readers Intellect, or enricht it with any true or uſeful Knowledge of Nature; but have rather taught him to admire their Subtlety, then Underſtand Hers. For to aſcribe all particular* Phænomena *that ſeem any thing Difficult, (for abundance are not* thought *ſo, that* are *ſo,) to* ſubſtantial Forms, *and, but* nominally underſtood, Qualities, *is ſo general and eaſie a way of reſolving Difficulties, that it allowes Naturaliſts, without Diſparagement, to be very Careleſs & Lazy, if it do not make them*

them ſo: as in effect we may ſee, that in about Two thouſand years ſince Ariſtotles *time the Adorers of his Phyſicks, at leaſt by vertue of* His peculiar Principles, *ſeem to have done little more then wrangle, without clearing up (that I know of) any myſtery of Nature, or producing any uſeful or noble Experiment: whereas the Cultivators of the Particularian Philoſophy, being obliged by the nature of their* Hypotheſis *and their way of Reaſoning to give the particular Accounts and Explications of particular* Phænomena *of Nature, are alſo obliged, not onely to know the general Laws and Courſe of Nature, but to enquire into the particular Structure of the Bodies they are converſant with, as that wherein, for the moſt part, their Power of acting and Diſpoſition to be acted on does depend. And in order to this, ſuch Enquirers muſt take notice of Abundance of minute Circumſtances; and to avoid miſtaking the Cauſes of ſome of them, muſt often make and vary Experiments; by which means Nature comes to be much more diligently and induſtriouſly Studied, and innumerable Particulars are diſcover'd and obſerved, which in the Lazy* Ariſtotelian *way of Philoſophizing would not be heeded. But to return to that Decad of Inſtances, to which theſe Advertiſements are premiſed; I hope I need not make an Apology for making choice rather of Chymicall Experiments, then others, in the ſecond and concluding Section of the Hiſtorical Part of the preſent Treatiſe. But though I preferre that* Kind *of*

Inſtances,

Inſtances, yet I would not be thought to overvalue Them *in their kind, or to deny, that ſome Artiſts may (for ought I know) be found, to whoſe Chymicall* Arcana *theſe Experiments may be little better then Trifles. Nor perhaps are theſe the conſiderableſt that I my ſelf could eaſily have communicated; (though theſe themſelves would not be now divulged, if I would have been ruled by the Diſſwaſions of ſuch as would have nothing of Chymical made common, which they think conſiderable.) But things of greater Value in themſelves and of Noble Uſe in Phyſick, may be leſſe fit for our preſent purpoſe, (which is not to impart Medicinal, or Alchymiſtical Proceſſes, but illuſtrate Philoſophical Notions,) then ſuch Experiments as theſe; which, beſides that they containe Variety of* Phænomena, *do not (for the moſt part) require either much Time, or much Charge, or much Skill.*

The II.

The II. Section
containing the
EXPERIMENTS.

Experiment I.

TAke good and clear Oyl of Vitriol, and caſt into it a convenient quantity of good Camphire groſly beaten; let it float there a while, and, without the help of external heat, it will inſenſibly be reſolv'd into a Liquor, which, from time to time, as it comes to be produc'd, you may, by ſhaking the Glaſs, mingle with the Oyl of Vitriol, whereunto you may by this means impart firſt a fine Yellow, & then a colour, which though it be not a true Red, will be of kin to it, and ſo very deep, as to make the very mixture almoſt quite Opacous. When all the Camphire is perfectly diſſolv'd by incorporating with the Menſtruum, if you hit upon good Ingredients, and upon a right proportion, (for a ſlight Miſtake in either of them may make this part of the Experiment miſcarry) you may probably obtaine ſuch a mixture, as I have more then once had, namely ſuch a one, as not onely to mee, whoſe ſence of Smelling is none of the dulleſt, but alſo to others, that knew not of

the Experiment, ſeem'd not at all to have an odour of the Camphire. Bnt if into this Liquor you pour a due quantity of fair Water, you will ſee (perhaps not without delight) that, in a trice, the Liquor will become pale, almoſt as at the firſt, and the Camphire, that lay conceal'd in the pores of the Menſtruum, will immediately diſcloſe it ſelf, and emerge in its own nature and priſtine form of white floating and combuſtible Camphire, which will fill not the Viol onely, but the neighbouring part of the Air with its ſtrong and diffuſive odour.

Now the *Phænomena* of this Experiment may, beſides the uſes we elſewhere make of it, afford us ſeveral particulars pertinent to our preſent purpoſe.

I. For (firſt) we ſee a lighter and conſiſtent Body brought by a comminution into Particles of a certain figure, to be kept ſwimming and mixed with a Liquor, on which it floated before, and which is, by great odds, heavier then it ſelf: ſo that as by the Solution of Gold in *Aqua Regis* it appeares, that the ponderouſeſt of Bodies, if it be reduc'd to parts minute enough, may be kept from ſinking in a Liquor much lighter then it ſelf: So this Experiment of Ours manifeſts what I know not whether hitherto Men have prov'd, that the Corpuſcles of lighter Bodies may be kept from emerging to the top of a much heavier Liquor: which inſtance being added to that of the Gold, may teach us, that, when

when Bodies are reduced to very minute parts, we must as well consider their particular Texture, as the received Rules of the Hydrostaticks, in determining whether they will sinke, or float, or swim.

II. This Experiment also shews, that several Colours, and even a very deep one, may soon be produc'd by a white Body and a clear Liquor, and that without the intervention of fire or any external heat.

III. And that yet this colour may, almost in the twinkling of an eye, be destroy'd, and as it were annihilated, and the latitant whiteness, as many would call it, may be as suddainly restor'd by the addition of nothing but fair Water, which has no colour of its own, upon whose account it might be surmised to be contrary to the perishing colour, or to heighten the other into a predominancy: nor does the Water take into its self either the colour it destroyed, or That it restores. For

IV. The more then semi-opacity of the Solution of Camphire and Oyle of Vitriol does presently vanish; and that Menstruum, with the Water, make up (as soon as the Camphorate Corpuscles come to be a float) one transparent and colourless Liquor.

V. And 'tis worth noting, that upon the mixture of a Liquor, which makes the Fluid much Lighter, (for so Water is in respect of Vitriol) a Body is made to emerge, that did not so, when

the Fluid was much heavier. This Experiment may ſerve to countenance what we elſewhere argue againſt the Schooles, touching the Controverſie about Miſtion. For whereas though ſome of them diſſent, yet moſt of them maintain, that the Elements alwayes looſe their Formes in the mix'd Bodies they conſtitute; and though if they had dexterouſly propoſed their Opinion, and limited their Aſſertions to ſome caſes, perhaps the Doctrine might be tolerated: yet ſince they are wont to propoſe it crudely and univerſally, I cannot but take notice, how little 'tis favour'd by this Experiment; wherein even a mixed Body (for ſuch is Camphire) doth in a further miſtion retaine its Forme and Nature, and may be immediately ſo divorced from the Body, to which it was united, as to turne, in a trice, to the manifeſt exerciſe of its former Qualities. And this Experiment being the eaſieſt Inſtance I have deviſ'd of the preſervation of a Body when it ſeems to be deſtroy'd, and of the Recovery of a Body to its former conditions, I deſire it may be taken notice of, as an inſtance I ſhall after have occaſion to have recourſe to and make uſe of.

VI. But the notableſt thing in the Experiment is, that Odours ſhould depend ſo much upon Texture; that one of the ſubtleſt and ſtrongeſt ſented Drugs, that the Eaſt it ſelf or indeed the World affords us, ſhould ſo ſoone quite looſe its Odour, by being mix'd with a Body that

that has ſcarce, if at all, any ſenſible Odour of its own, and this, while the Camphorate Corpuſcles ſurvive undeſtroy'd, in a Liquor, from whence one would think that leſſe ſubtle and fugitive Bodies then they ſhould eaſily exhale.

VII. Nor is it much leſſe conſiderable, that ſo ſtrong and piercing a Sent as that of Camphire ſhould be, in a moment, produc'd in a Mixture, wherein none of it could be perceiv'd before, by ſuch a Liquor as Water, that is quite devoid of any Odour of its own: which ſo eaſie and ſuddain reſtauration of the Camphire to its Native Sent, as well as other Qualities, by ſo languid a Liquor as common Water, doth likewiſe argue, that the Union or Texture of the two Ingredients, the Camphire and the Oyl of Vitriol, was but very ſlight, upon which nevertheleſſe a great alteration in point of Qualities depended. And to confirme that divers of the preceding *Phænomena* depend upon the particular Texture of the Liquors imploy'd to exhibit them, I ſhall adde, that if inſtead of oyl of Vitriol you caſt the Concrete into well dephlegm'd Spirit of Nitre, you will obtain no red nor dark but a Tranſparent and Colourleſs Solution. And when to the above mention'd red Mixture I put inſtead of fair Water about two or three parts of duely rectifi'd Spirit of Wine, there would enſue no ſuch changes, as thoſe formerly recited; but the Spirit of Wine, that diſſolv'd the Concrete,

when it was by it ſelf, without looſing its Diaphaneity, or acquiring any Colour, did, when it diſſolv'd the Mixture, diſſolve it with its new adventitious colour, looking like a groſſe red Wine, ſomewhat turbid, or not yet well freed from its Lees: ſo that this Colour appear'd to reſide in the Mixture as ſuch, ſince neither of the two Ingredients diſſolv'd in or mingled with the Spirit of Wine would have afforded that Colour, or indeed any other. But if to this Liquor, that look'd like troubled Wine, we poured a large Proportion of fair Water, the Redneſſe would immediately vaniſh, and the Whole would, *as to ſenſe*, become White throughout; I ſay, *as to ſenſe*; becauſe the Whiteneſſe did not indeed appertain properly to the whole Mixture, but to a huge multitude of little Corpuſcles of the reviv'd Concrete, whereof ſome or other, which at firſt ſwamme confuſedly to and fro, left no ſenſible portion of the Liquor unfurniſh'd with ſome of them; whereas when the Camphorate Corpuſcles had leiſure to emerge, as they ſoon did, they floated in the forme of a White Powder or Froth at the top of the Liquor, leaving all the reſt as clear and colourleſſe as the common Water.

But we have not yet mention'd all the uſe we deſign'd to make of our Mixture, for by proſecuting the Experiment a little further, we made it afford us ſome new *Phænomena*.

VIII. For having kept the Mixture in a moderately

cerately warme place, (which circumstance had perhaps no influence on the Successe,) and having dstill'd it out of a Glasse Retort, the event answer'd our expectation, and the Liquor, that came over, had a Sent; which, though very strong, was quite differing both from that of the Mixture and that of the Camphire; and in the remaining Body, though the Liquor and the Camphire it consisted of were either both transparent, or the one transparent as a Liquor, and the other white, as transparent and colourlesse Bodies are wont to be made by contusion: yet the remaining Masse, which amounted to a good part of the Mixture, was not onely Opacous, but as black as Coal, in some places looking just like polished Jet; which is the more considerable, because that though Vegetable Substances, that are not fluid, are wont to acquire a Blacknesse from the fire, yet neither do Liquors, that have already been distill'd, obtain that Colour upon Redistillation; neither have we, upon Tryal purposely made, found, that Camphire, expos'd to fire in a Retort, fitted with a Receiver, (which was the case of the present Experiment) would at all acquire a Jetty Colour, but would either totally ascend White, or afford *Flores*, and a *Caput mortuum* (as a vulgar Chymist would call the Remaines) of the same Colour, both in respect of one another, and in respect of the Camphire.

IX And our Experiment afforded this notable

table *Phænomenon*, that though Oyl of Vitriol be a distill'd Liquor, and though Camphire be so very fugitive a Substance, that being left in the Air it will of it self fly all away; and therefore Physicians and Druggists prescribe the keeping it in Linseeds or *Millium* or other convenient Bodies to hinder its Avolation; yet, by our Experiment, its Fugacity is so restrain'd, that not onely the *Caput mortuum* newly mention'd endured a good fire in the Retort, before it was reduc'd to that pitchy Substance we were lately mentioning, but having taken some of that substance out of the Retort, and order'd it by a careful Workman to be kept in a closely cover'd Crucible during some time in the fire; when it was brought me back, after the Pot had been kept red hot above half an hour, there remain'd a good quantity of the Matter, brittle, without any smell of Camphire, and as black as ordinary Charcoal; so much do the Fixity and Volatility of Bodies depend upon Texture.

Experiment II.

AMong those other Experiments of mine, (*Pyrophilus*) which tend to manifest, that new Qualities may be produc'd in Bodies, as the Effects of new Textures; I remember, some years ago, I writ for a Friend a whole Set of Tryals, that I had made about the Changes I could

could produce in Metals and Minerals by the Intervention of Sublimate. But though the whole Tract, wherein they are recited, might be pertinent enough to our preſent Subject, yet reſerving other paſſages of it for other places, (eſpecially for our Notes upon thoſe particular Qualities, which they are moſt proper to illuſtrate,) it may at this time ſuffice me to ſend you a Tranſcript of what that Account contains relating to Copper and Silver, the one a mean and fugitive, and the other a noble and fix'd Metal. For thoſe changes in Colour, Conſiſtence, Fuſibleneſſe, and other Qualities, which you will meet with in theſe Experiments, will afford us divers *Phænomena*, to ſhew what great changes may be made, even in Bodies ſcarce corruptible, by one or more of thoſe three Catholick wayes of Natures working according to the Corpuſcular Principles, namely, the Acceſſe, the Receſſe, and the Tranſpoſition of the minute Particles of Matter.

As for my Method of changing the Texture of Copper, I confeſſe it hath oftentimes ſeem'd ſtrange to me, that Chymiſts, plainly ſeeing the notable Effect, that Sublimate diſtill'd from Antimony has upon that Mineral, by opening it and volatilizing it, (as we ſee it do in the making of what they are pleaſ'd to call *Mercurius vitæ*) ſhould not have the curioſity to try, whether or no Sublimate might not likewiſe produce, if not the ſame, yet a conſiderable

rable Change in other Mineral Bodies, there appearing no reaſon, or at leaſt there having been none given, that I know of, why the Reſerating Operation (if I may ſo ſpeake) of Sublimate ſhould be confin'd to Antimony. Upon theſe conſiderations, we were invited to endeavour to ſupply the neglect we had obſerv'd in Chymiſts of improving the Experiment of *Butyrum Antimonii*: and though an indiſpoſition in point of Health, which befel us before we had made any great progreſſe in our Enquiries, made us ſo ſhy of the Fumes of Sublimate and Minerals, that we neither did make all our Tryals ſo accurately, nor proſecute them ſo far as we would have done, had we been to deal with more innocent Materials: Yet we ſuppoſe it will not be unwelcome to You to receive from us a naked, but faithful, Narrative of our Proceedings; being apt to think, that you will therein find Inducements to carry on this Experiment further then we have done, and to compleat what we have but begun.

Firſt then, we took half a pound of Copper plates, of about an Inch broad, and the thickneſſe of a Grain of Wheat, (which we after found was too great) and of an arbitrary length; then caſting a Pound of groſly beaten *Venetian* Sublimate into the bottom of a ſomewhat deep Glaſſe Retort, we caſt in the Copper plates upon it, that the Fumes of the Sublimate might, in their Aſcenſion, be compell'd to act upon the

the incumbent metal; and then placing this Retort as deep as we well could in a Sand furnace, & adapting to it a ſmall Receiver, we adminiſter'd a gradual fire ſeaven or eight hours, and at length for a while increaſ'd the heat, as much as we well could do in ſuch a Furnace. The ſucceſſe of this Operation was as follows.

1. There came little or no liquor at all over into the Receiver, but the neck and upper part of the Retort were candied on the inſide, by reaſon of the copious Sublimate adhering to them, which Sublimate weigh'd above ten Ounces; in the Retort we found about two ounces and a quarter of running Mercury, which had been ſuffer'd to revive by the acid Salts, which corroding the Copper forſook the Quickſilver, whereto they had been in the Sublimate united.

2. Upon the increaſe of the fire there was plainly heard a Noiſe, made by the melting Matter in the Retort, not unlike that of a boyling pot or of Vitriol, when being committed to a Calcining fire, it is firſt brought to flow. And this noiſe we found to be a more conſtant circumſtance of this Experiment, then the revification of part of the Mercury contain'd in the Sublimate; for upon another Tryal made with the former proportion of Copper plates and Sublimate, we obſerv'd, during a very long while, ſuch a Noiſe as hath been already mention'd, but the Operation being finiſh'd, we ſcarce found ſo much as a few grains of running Mer-

Mercury either in the Retort or Receiver.

3. We found the Metalline lump in the bottom of the Retort to have been increaſ'd in weight ſomewhat more then (though not half an ounce above) two ounces; ſome of the Copper plates, lying at the bottom of the Maſſe, retain'd yet their figure and malleableneſſe, which we aſcrib'd to their not having been thin enough to be ſufficiently wrought upon by the Sublimate: the others, which were much the greater number, had wholly loſt their Metalline form, and were melted into a very brittle lump, which I can compare to nothing more fitly then a lump of good Benjamin; for this maſs, though ponderous, was no leſſe brittle, and being broken appear'd of diverſe colours, which ſeem'd to be almoſt tranſparent, and in ſome places it was red, in others of a high and pleaſant Amber colour, and in other parts of it colours more darkiſh and mixt might be diſcern'd.

4. But this ſtrange Maſſe, being broken into ſmaller lumps, and laid upon a ſheet of white Paper in a Window, was by the next morning, where ever the Air came at it, all cover'd with a lovely greeniſh Blew, or rather blewiſh Green; almoſt like that of the beſt Verdigreeſe, and the longer it lay in the air, the more of the internal parts of the fragments did paſſe into the ſame colour: but the white Paper, which in ſome places they ſtain'd, ſeem dy'd of a green colour inclining unto yellow. And here

here we had occaſion to take notice of the inſinuating ſubtilty of the Air; for having put ſome pieces of this Cupreous Gum (if I may ſo call it) into a little Box to ſhut out the air, which we have found it poſſible to exclude by other means, we found, that notwithſtanding our care thoſe included fragments were, as well as the reſt already mention'd, covered with the powder as it were of *viride Æris*.

5. We muſt not on this occaſion omit to tell you, that having the laſt year made ſome Tryals in reference to this Experiment, we obſerv'd in one of them, that ſome little Copper plates, from which Sublimate had been drawn off, retain'd their priſtine ſhape and Metalline nature, but were whitened over like Silver, and continu'd ſo for diverſe months; (though we cannot preciſely tell you how long, having at length accidentally loſt them.) And to try whether this Whiteneſſe were onely ſuperficial, we purpoſely broke ſome of theſe flexible Plates, and found, that this Silver colour had penetrated them throughout, and was more glorious in the very body of the Metal, then on its Surface, which made us ſuſpect, that the Sublimate by us imploy'd had been adulterated with Arſenick, (wherewith the Sophiſticators of Metals are wont to make Blanchers for Copper, but not to mention, that the malleableneſſe continu'd, which Arſenick is vvont to deſtroy) we diſcover'd not by Tryal, that the Sublimate was other then ſincere.

6. In

6. In this Metalline Gum the body of the Copper appear'd ſo chang'd and open'd, that we were invited to look upon ſuch a change as no ignoble Experiment, conſidering the difficulty which the beſt Artiſts tell us there is, and which thoſe that have attempted it have found, I ſay not to unlock the Sulphur of Venus, but to effect leſſe changes in its Texture then was hereby made. For this Gum, caſt upon a quick coal and a little blown, will partly melt and flow like Roſin, and partly flame and burn like a Sulphur, and with a flame ſo laſting, if it be rekindled as often as it leaves off burning, that we obſerv'd it, not without ſome wonder; and ſo inflammable is this opened Copper, that being held to the flame of a candle or a piece of lighted paper, it would almoſt in a moment take fire, and ſend forth a flame like common Sulphur, but onely that it ſeem'd to us to incline much more to a greeniſh colour, then the blewer flame of Brimſtone is wont to do.

To theſe *Phænomena* of our Experiment, as it was made with Copper, my Notes inable me to ſubjoyn ſome others, exhibited when he made it with Sublimate and Silver.

There were taken of the pureſt ſort of coined Silver we could get half a ſcore of thin Plates, on which was caſt double the weight of Sublimate in a ſmall and ſtrongly coated Retort. This Matter being ſublim'd in a naked fire, we found, (having broken the Veſſel) that the Sublimate

was

was almoſt totally aſcended to the top and neck of the Retort, in the latter of which appear'd in many places ſome reviv'd Mercury, in the bottom of the Retort we found a little fluxed lump of Matter, which twas ſcarce poſſible to ſeparate from the Glaſſe, but having with much adoe divorc'd them, we found this Maſſe to be brittle, of a pale yellowiſh colour, of neer about the weight of the Metal on which the Sublimate had been caſt. And in the thicker part of this lump there appear'd when it was broken ſome part of the Silver plates, which, though brittle, ſeem'd not to have been perfectly diſſolv'd. This reſin of Silver did like that of Copper, but more ſlowly, imbibe the moiſture of the Air, and within about twenty four hours, was cover'd with a ſomewhat greeniſh duſt, concerning which we durſt not determine, whether it proceeded from that mixture of Copper, which is generally to be met with in coyned Silver, or from the compounded Metal. For the more curious ſort of Painters do, as they inform us, by corroding coyned Silver with the fretting ſteams of ſaline Bodies, or with corroſive bodies themſelves turn it into a fine kind of Azure, as we may elſe where have opportunity more particularly to declare. I ſhall now onely adde, that ſome ſmall fragments of our Reſin being caſt upon red hot coals did there waſt themſelves in a flame not very differing in colour from that of the former mention'd reſin of Copper, but much more durable

rable then would have been eaſily expected from ſo ſmall a quantity of matter.

This is all the account I can give you of our firſt Tryal, but ſuſpecting that the Copper vvont to be mixt as an alloy with our coyned Silver might have too much influence on the recited Event; coming afterwards into a place, vvhere we could procure refin'd Silver, we took an ounce of That, and having laminated it, vve caſt it upon twice its weight of beaten Sublimate, which being driven away from it with a ſomewhat ſtrong fire, we took out of the bottom of the Glaſſe Retort a lump of Matter, which in ſome places, where it lay next the Glaſſe, was as it were ſilver'd over very finely, but ſo very thinly, that the thickneſſe of the Silver ſcarce equall'd that of fine white Paper; the reſt of the Metal (except a little that lay undiſſolv'd almoſt in the middle of the Maſſe, becauſe, as we ſuppoſ'd, the Plates had not been beaten till they were ſufficiently and equally thin) having been, by the ſaline part of the Sublimate that ſtuck to it, colliquated into a maſſe that look'd not at all like Silver, or ſo much as any other Metal or Mineral.

And tis remarkable, that though Silver be a fixt Metal, and accounted indeſtructible, yet it ſhould by ſo ſlight an operation, and by but about a quarter of its weight of additament, (as appear'd by weighing the whole Lump) be ſo ſtrangely diſguized, and have its qualities ſo alter'd.

For

For (first) though an eminent Whiteneſſe be accounted the colour which belongs to pure Silver, and though beaten Sublimate be alſo eminently White; yet the Maſſe we are ſpeaking of was partly of a Lemmon or Amber colour, or a deep Amethyſtinine colour, and partly of ſo dark an one, as it ſeem'd black: and it was pretty, that ſometimes in a fragment, that ſeem'd to be one continued and entire piece, the upper part would be of a light Yellow, which abruptly ending, the lower was of a colour ſo obſcure, as ſcarce to challenge any name diſtinct from Black.

Next, whereas Silver is one of the moſt Opacous Bodies in Nature, and Sublimate a White one, the produc'd Maſſe was in great part Tranſparent, though not like Glaſſe, yet like good Amber.

Thirdly, the Texture of the Silver was exceedingly alter'd; for our Maſſe, inſtead of being Malleable and Flexible, as that Metal is very much, appear'd, if you went about to cut it with a Knife, like Horne, yet otherwiſe eaſily apt to crack and break, though not at all to bend.

Fourthly, whereas Silver will endure Ignition for a good while before it be brought to Fuſion, our Mixture will eaſily melt, not onely upon quick coales, but in the flame of a Candle; but this Reſin, or Gum (if I may ſo call it) of our fix'd Metal did not, like that we formerly deſcrib'd of Copper, tinge the flame

of a Candle, or produce with the glowing coals, on which tis laid, either a green or blewiſh colour.

And (*Pyrophilus*) to diſcover how much theſe Operations of the Sublimate upon Copper and Silver depend upon the particular Textures of theſe Bodies, I took two parcels of Gold, the one common Gold thinly laminated, and the other very well refin'd, and having caſt each of theſe in a diſtinct Urinal upon no leſſe then thrice its weight of groſly beaten Sublimate, I cauſ'd this laſt nam'd ſubſtance to be in a Sand furnace elevated from the Gold, but found not, that either of the two Parcels of that Metal was manifeſtly alter'd thereby: whether in caſe the Gold had been reduc'd to very minute particles, ſome kind of change (perhaps, if any, differing enough from thoſe lately recited to have been made in the Copper and the Silver) might have been made in it, I am not ſo abſolutely certain; but I am confident, that by what I reſerve to tell you hereafter of Sublimates Operation upon ſome other Minerals, eſpecially Tin, it will appear, that that Operation depends very much upon the particular Texture of the Body, from whence that Sublimate is elevated.

Before I diſmiſſe this ſubject, *Pyrophilus*, I muſt not conceale from you, that in the Papers, whence theſe Experiments made with Sublimate have been tranſcribed, I annex'd to the

the whole Diſcourſe a few Advertiſements, whereof the firſt was, That I was reduced in thoſe Experiments to imploy, for want of a better, a Sand Furnace, wherein I could not give ſo ſtrong a fire as I deſired, which circumſtance may have had ſome Influence upon the recited *Phænomena*; and among other Advertiſements there being one, that will not be impertinent to my preſent Deſigne, and may poſſibly afford a not unſucceſsfull Hint, I ſhall ſubjoyne it in the words, wherein I find it deliver'd.

The next thing, of which I am to advertiſe you, is this, That this Experiment may probably be further improv'd by imploying about it various and new kinds of Sublimate, and that ſeverall other things may be ſublimed up together either with crude Mercury or with common Sublimate, he that conſiders the way of making vulgar Sublimate will not, I ſuppoſe, deny. To give you onely one Inſtance, I ſhall inform you, that, having cauſ'd about equal parts of common Sublimate and Sal Armoniack to be well powder'd and incorporated, by ſubliming the Mixture in ſtrong and large Urinals placed in a Sand Furnace, we obtain'd a new kind of Sublimate, differing from the former, which we manifeſted *ad Oculum*, by diſſolving a little of it and a little of common Sublimate ſeverally in fair water; for dropping a little reſolv'd ſalt of Tartar upon the ſolution of common Sublimate, it immediately turn'd of an Orange

tawny colour, but dropping the ſame Liquor upon the ſolution of the Ammoniack Sublimate, if I may ſo call it, it preſently turn'd into a Liquor in Whiteneſſe reſembling Milk. And having from four ounces of Copper plates drawn ſix ounces of this new Sublimate after the already often recited manner, we had indeed in the bottom of the Retort a Cupreous Reſin, not much unlike that, made by Copper and common Sublimate; and this Reſin did, like the other, in the moiſt Air ſoon begin to degenerate into a kind of Verdigreeſe. But that which was ſingular in this Operation was, that not onely ſome of the Sublimate had carried up, to a good height, enough of the Copper to be manifeſtly colour'd by it of a fine blewiſh Green, but into the Receiver there was paſs'd neer an Ounce of Liquor, that ſmelt almoſt like ſpirit of Sal Armoniack, and was tincted like the Sublimate, ſo that we ſuppoſ'd the Body of the Venus to have been better wrought upon by this, then by the former Sublimate. And yet I judg'd not this way to be the moſt effectual way of improving common Sublimate, being apt to think upon grounds not now to be mention'd, that it may by convenient Liquors be ſo far enrich'd and advanc'd, as to be made capable of opening the compact Body of Gold it ſelf, and of producing in it ſuch changes, (which yet perhaps will enrich but mens Underſtandings,) as Chymiſts are wont very fruitleſly

to

to attempt to make in that almoſt Indeſtructible Metal. But of This, having now given you a Hint, I dare here ſay no more.

Experiment III.

THere is (*Pyrophilus*) another Experiment, which many will find more eaſie to be put in practice, and which yet may, as to Silver, be made a kind of *Succedaneum* to the former, and conſequently may ſerve to ſhew, how the like Qualities in Bodies may be effected by differing Wayes, provided a like Change of Texture be produc'd by them. Of this I ſhall give you an Example in that Preparation of Silver, that ſome Chymiſts have call'd *Luna Cornea*, which I ſhall not ſcruple to mention particularly and apply to my preſent purpoſe; becauſe though the name of *Luna Cornea* be already to be met with in the Writings of ſome Alchymiſts, yet the thing it ſelf, being not uſ'd in Phyſick, is not wont to be known by thoſe that learn Chymiſtry in order to Phyſick; and the way that I uſe in making it is differing from that of Alchymiſts, being purpoſely deſign'd to ſhew ſome notable *Phænomena*, not to be met with in their way of proceeding.

We take then refined Silver, and having beaten it into thin Plates, and diſſolv'd it in about twice its Weight of good *Aqua fortis*, we Filtrate it carefully to obtaine a cleare

ſolution; (which ſometimes we Evaporate further, till it ſhoot into Chryſtals, which we afterwards dry upon brown Paper with a moderate heat.)

Upon the abovemention'd ſolution we drop good ſpirit of Salt, till we find, that it will no more curdle the Liquor it falls into, (which will not happen ſo ſoon, as you will be apt at firſt to imagine) then we put the whole Mixture in a Glaſſe Funnel lin'd with Cap-paper, and letting the moiſture drain through, we dry with a gentle heat the ſubſtance, that remains in the Filtre, firſt waſhing it (if need be) from the looſly adhering Salts, by letting fair Water run through it ſeveral times, whilſt it yet continues in the Filtre. This ſubſtance being well dry'd, we put it into a Glaſſe Viol, which being put upon quick coals firſt covered with Aſhes, and then freed from them, we melt the contain'd ſubſtance into a Maſſe, which, being kept a while in Fuſion, gives us the *Luna Cornea* we are now to conſider.

If to make this Factitious Concrete, we firſt reduce the Silver into Chryſtals, and afterwards proceed with ſpirit of Salt, as we have juſt now taught you to do with the ſolution, we have the exceedingly Opacous, Malleable, and hardly Fuſible Body of Silver, by the convenient interpoſition of ſome ſaline Particles, not amounting to the third part of the Weight of the Metal, reduc'd into Chryſtals, that both ſhoot in

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a peculiar and determinate figure, differing from those of other Metals, and also are diaphanous and brittle; and by great odds more easily fusible then Silver it self, besides other Qualities, wherein having elsewhere taken notice, that these Chrystals differ both from Silver and from *Aqua fortis*, we shall not now insist on them, but passe to the Qualities, that do more properly belong to the change of the Solution of Silver into *Luna Cornea*.

First then we may observe, that though spirit of Salt be an highly acid Liquor, and though acid Liquors and *Alkalys* are wont to have quite contrary Operations, the one precipitating what the other would dissolve, and dissolving what the other would precipitate: yet in our case, as neither Oyl of Tartar *per deliquium*, nor spirit of Salt will dissolve Silver, so both the one and the other will precipitate it; which I desire may be taken notice of against the Doctrine of the Vulgar Chymists, and as a Proof, that the Precipitation of Bodies depends not upon acid or Alkalizate Liquors as such, but upon the Texture of the Bodies, that happen to be confounded.

2. We may here observe, that Whiteness and Opacity may be immediately produc'd by Liquors, both of them Diaphanous and colourlesse.

3. That

3. That on the other ſide a White Powder, though its minute parts appear not tranſparent, like thoſe of beaten Glaſſe, Roſin, *&c.* which, by comminution, are made to ſeem White, may yet, by a gentle heat, be preſently reduc'd into a Maſſe indifferently Tranſparent, and not at all White, but of a fair Yellow.

4. We may obſerve too, that though Silver require ſo ſtrong a fire to melt it, and may be long kept red hot, without being brought to Fuſion; yet by the aſſociation of ſome ſaline particles conveniently mingled with it, it may be made ſo fuſible, as to be eaſily and quickly melted, either in a thin Viol, or at the flame of a Candle, where it will flow almoſt like Wax.

5. It may alſo be noted, that though the Lunar ſolution and the ſpirit of Salt would, either of them apart, have readily diſſolv'd in Water; yet when they are mingled, they do, for the moſt part, concoagulate into a ſubſtance, that will lie undiſſolv'd in Water, and is ſcarce, if at all, ſoluble either in *Aqua fortis* or in ſpirit of Salt.

6. And remarkable it is, that the Body of Silver being very flexible and malleable, (eſpecially if the Metal be, as ours was, refin'd) it ſhould yet, by the addition of ſo ſmall a proportion of Salt, (a Body rigid and brittle) as is aſſociated to it in our Experiment, be made of a Texture ſo differing from what either of its

Ingredients

Ingredients was before, being wholly unlike either a Salt or a Metal, and very like in texture to a piece of Horn. And to ſatisfie my ſelf how much the toughneſſe of this metalline Horn depended upon the Texture of the *Compoſitum*, reſulting from the reſpective Textures of the ſeveral ingredients, I precipitated a ſolution of Silver with the diſtill'd ſaline Liquor commonly call'd oyl of Vitriol, in ſtead of ſpirit of Salt, and having waſh'd the precipitate with common water, I found agreeably to my conjecture, that this Precipitate, being flux'd in a moderate heat, afforded a maſſe that look'd like enough to the Concrete we have been diſcourſing of, but had not its Toughneſſe, being brittle enough to be eaſily broken in pieces. But the two conſiderableſt *Phænomena* of our Experiment do yet remain unmention'd.

For 7^thly^, tis odd, that whereas a ſolution of Silver is, as we have often occaſion to note, the bittereſt Liquor we have ever met with, and the ſpirit of Salt far ſowrer then either the ſharpeſt Vinegar, or even the ſpirit of it, theſe two ſo ſtrongly and offenſively taſted Liquors ſhould be ſo eaſily and ſpeedily, without any other thing to correct them, be reduc'd into an inſipid ſubſtance, (at leaſt ſo far inſipid, that I have lick'd it ſeveral times with my tongue, without finding it otherwiſe, though perhaps with much rowling it to and fro in the mouth, it may at length afford ſome unpleaſant taſt,

but

but exceedingly different from that of either of the liquors that compos'd it:) and this, though the Salts that made both the Silver and the precipitating spirit so strongly tasted remain associated with the Silver.

8. And lastly, it is very strange, that though the saline Corpuscles, that give the efficacy both to good *Aqua fortis* and the like spirit of Salt, be not onely so volatile that they will easily be distill'd with a moderate fire, but so fugitive, that they will in part fly away of themselves in the cold air, (as our noses can witnesse to our trouble, when the Viols that contain such liquors are unstopt) yet by virtue of the new Texture they acquire by associating themselves with the Corpuscles of the Silver and with one another, these minute particles of salt loose so much of their former lightnesse, and acquire such a degree of fixednesse, that they will endure melting with the metal they adhere to, rather then suffer themselves to be driven away from it. Nor do I remember, that when I melted this masse in a thin Viol, I could perceive any sensible Evaporation of the Matter: nay having afterwards put a parcel of it upon a quick Coal, though that were blown to intend the heat, yet it suffer'd Fusion, and so ran off from the Coal, without appearing, when it was taken up again, to be other then *Luna Cornea*, as it was before.

Experiment IV.

Experiment IV.

I Am now (*Pyrophilus*) about to do a thing, contrary enough both to my Cuſtome and Inclination, that is, to diſcourſe upon the *Phænomena* of an Experiment which I do not teach you to make. But ſince I cannot as yet, without ſome breach of promiſe, plainly diſcloſe to you what I muſt now conceal, your Equity aſſures me of your pardon. And as becauſe the Qualities of the Salt I am to ſpeak of are very remarkable and pertinent to my preſent purpoſe, I am unwilling to paſſe them by unmention'd; ſo I hope, that notwithſtanding their being ſtrange I may be allow'd to diſcourſe upon them to you, who, I preſume, know me too well to ſuſpect I would impoſe upon you in matters of fact, and to whom I am willing (if you deſire it) to ſhew the Anomalous ſalt it ſelf, and Ocular proofs of the chief properties I aſcribe to it.

I ſhall not then ſcruple to tell you, that diſcourſing one day with a very ingenious Traveller and Chymiſt, who had had extraordinary opportunities to acquire Secrets, of a certain odd Salt I had thought upon and made, which was of ſo differing a kind from other Salts, that though I did not yet know what Feats I ſhould be able to do with it, yet I was confident it muſt have noble and unuſual Operations. This Gentleman

Gentleman to requite my frankneſſe, told me, that I had lighted on a greater Jewel then perhaps I was aware of; and that if I would follow his advice, by adding ſomething that he nam'd to me, and proſecuting the Preparation a little further, I ſhould obtain a Salt exceedingly noble. I thank'd him, as I had cauſe, for his Advice, and when I had opportunity follow'd it. And though I found the way of making this Salt ſo nice and intricate a thing, that if I would, I could ſcarce eaſily deſcribe it, ſo as to enable moſt men to practice it; yet having once made it, I found, that beſides ſome of the things I had been told it would perform, I could do divers other things with it which I had good cauſe to believe the Gentleman of whom I was ſpeaking did not think of; and I doubt not, but I ſhould have done much more with it, if I had not unfortunately loſt it ſoon after I had prepar'd it.

Several of the *Phænomena* I try'd to produce with it, which are not ſo proper for this place, are reſerv'd for another, but here I ſhall mention a few that beſt fit my preſent purpoſe.

Firſt then, though the ſeveral ingredients that compoſ'd this Salt, were all of them ſuch, as vulgar Chymiſts muſt according to their principles look upon as purely ſaline, and were each of them far more ſalt then Brine, or more ſowr then the ſtrongeſt Vinegar, or more ſtrongly taſted then either of thoſe two liquors; yet the Compound, made up of onely ſuch Bodies, is

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ſo far from being eminently ſalt, or ſowr, or inſipid, that a ſtranger being ask'd what taſt it had, would not ſcruple to judge it rather ſweet, then of any other taſt: though its ſweetneſſe be of a peculiar kind, as there is a difference even among Bodies ſweet by nature; the ſweetneſſe of Sugar being diverſe from that of Honey, and both of them differing from that of the ſweet Vitriol of Lead. And this is the onely inſtance I remember I have hitherto met with of Salts, that, without the mixture of inſipid Bodies, compoſe a ſubſtance *really ſweet*. I ſay *really ſweet*, becauſe Chymiſts oftentimes term the *Calces* of Metals and other Bodies *dulcifi'd*, if they be freed from all corroſive ſalts and ſharpneſſe of Taſt, *ſweet*, though they have nothing at all of poſitive ſweetneſſe in them; and by that licenſe of ſpeaking do often enough impoſe upon the Unskilful.

Another thing conſiderable in our Anomalous Salt is, that though its odour be not either ſtrong or offenſive, (both which that of Volatile ſalts is wont to be) yet if it be a little urg'd with heat, ſo as to be forc'd to evaporate haſtily and copiouſly, I have known ſome, that have been uſ'd to the powerful ſtink of *Aqua fortis*, diſtill'd Urine, and even ſpirit of Sal Armoniack it ſelfe, that have complain'd of this ſmell as more ſtrong, and upon that account more unſupportable then theſe themſelves: and yet when theſe Fumes ſettle again into a Salt,

ſalt, their odour will again prove mild and inoffenſive, if not pleaſant.

Thirdly, whereas all the Volatile and Acid and Lixiviate ſalts that we know of are of ſo determinate and ſpecificated a nature, if I may ſo ſpeak, that there is no one ſort of the three but may be deſtroy'd by ſome one or other of the other two ſalts, if not by both, as ſpirit of Urine, which is a volatile ſalt, being mingled with ſpirit of Salt or *Aqua fortis* or almoſt any other ſtrong and acid ſpirit, will make a great Ebullition, and looſe its peculiar taſt, and ſeveral of its other qualities; and on the othe ſide, ſalt of Tartar and other *Alkalys*, (that is, Salts produc'd by incineration of mix'd Bodies) will be deſtroy'd with Ebullition by *Aqua fortis*, ſpirit of Salt, or almoſt any other ſtrong ſpirit of that Family. And ſpirit of ſalt, *Aqua fortis*, *&c.* will be (as they ſpeak) deſtroy'd both by Animal volatile ſalts, and by the fix'd ſalts of Vegetables; that is, will make an Efferveſcence with either ſort of ſalts, & compoſe with them a new liquor or ſalt, differing from either of the ingredients, and, as to taſt, ſmell, odour, and diverſe other qualities, more languid and degenerous: whereas, I ſay, each of theſe three families of Salts may be eaſily deſtroy'd by the other two, our Anomalous Salt ſeems to be above the being *thus wrought* upon by any of all the three, and is the onely Body I know: (which is no ſmall priviledge or rather prerogative) for

I did not find, that a Solution of it, made with as little water as I could, which is the way whereby we usually make it fluid, would make any Ebullition either with oyl of Tartar *per Deliquium*, or spirit of *sal* Armoniack, or strong spirit of Salt, or even oyl of Vitriol, but would calmely and silently mix with these differing Liquors, and continue as long as I had patience to look upon them without being precipitated by them. But this is not the onely way I imploy'd to examine whether our Salt belong'd to any of the three above mention'd comprehensive families of Salts. For I found not that the strongest solution of it would turn Syrup of Violets either red, as acid spirits do, or green, as both fix'd and volatile Salts will do. Nor would our solution turn a clear one of Sublimate made in common water either white, as spirit of Urine, Sal Armoniack, or others of the same family, or into an orange tawny, like salt of Tartar, and other *Alkalys*; but left the solution of Sublimate transparent, without giving it any of these colours, mingling it self very kindly with it, as it had done with the four lately mention'd Liquors. And to satisfie my self a little further, I not onely try'd, that an undiscolour'd mixture of syrup of Violets and our solution would immediately be turn'd red by two or three drops of spirit of salt, or green by as much oyl of Tartar: but to prosecute the Experiment, I let fall a drop or two of a mixture made of our A-

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homalous ſolution, and ſpirit of Salt well ſhaken together, upon ſome ſyrup of Violets, which was thereby immediately turn'd red, and a little of the ſame Anomalous ſolution, being ſhaken together with Oyl of Tartar *per Deliquium*, turn'd another parcel of the ſame ſyrup of Violets into a delightful green; which, hapning as I expected, ſeem'd to argue, that our Solution, though as to ſenſe it were exquiſitely mingled in the ſeveral mixtures, to which I had put it, did, as it left them their undeſtroy'd reſpective Natures, retain its own; and yet this Salt is ſo farre from being a languid or an inſignificant thing, that *Aqua fortis*, and Oyl of Vitriol themſelves, as operative and as furious Liquors as they are, are unable in divers caſes to make ſuch Solutions, and performe ſuch other things, as our calme but powerful Menſtruum can though but ſlowly effect.

Fourthly, Though this Salt be a volatile one, and requires no ſtrong heat to make it ſublime into finely figur'd Chryſtals without a remanence at the bottome; yet being diſſolv'd in Liquors, you may make the Solution, if need be, to boile, without making any of the Salt ſublime up, before the Liquor be totally or almoſt totally drawn off, whereas the volatile ſalt of Urine, Bloud, Harts-horn, *&c.* are wont to aſcend before almoſt any part of the Liquor they are diſſolv'd in, which is in many caſes very inconvenient.

And

And though this be a Volatile ſalt, yet I remember not, that I have obſerv'd any fix'd ſalt, (without excepting ſalt of Tartar it ſelf) that runs near ſo ſoon *per Deliquium*, as this will do; but by abſtraction of the adventitious moiſture 'tis eaſily reſtor'd to its former ſaline forme: and yet differs from ſalt of Tartar, not onely in Fixedneſſe and Taſte and divers other qualities, but alſo in this, that, whereas ſalt of Tartar requires a vehement fire to flux it, a gentlier heat then one would eaſily imagine will melt our Salt into a Limpid Liquor.

And whereas ſpirit of Wine will diſſolve ſome Bodies, as Sanderick, Maſtick, Gum-Lac, *&c.* and Water, on the other ſide, diſſolves many that ſpirit of Wine cannot, and Oyls will diſſolve ſome, for which neither of the other Liquors are good ſolvents; our ſalt will readily diſſolve both in fair Water, in the higheſt rectifi'd ſpirit of Wine, (and that ſo little, as not to weigh more then the ſalt) and in Chymical Oyls themſelves, with which it will aſſociate its ſelf very ſtrictly, and perhaps more too, then I have yet found any other coſinſtent Salt to doe.

Experiment V.

THe Experiment I am (*Pyrophilus*) now about to deliver, though I have not yet had Opportunity to perfect what I deſign'd,

when ſome Notions that I have about Fire and Salt ſuggeſted it to me, is yet ſuch as may far more clearly, then almoſt any of the Experiments commonly known to Chymiſts, ſerve to ſhew us, how near to a real Tranſmutation thoſe Changes may prove, that may be effected even in inanimate, and, which is more, ſcarce corruptible Bodies, by the receſſe of ſome Particles, and the acceſſe of ſome others, and the new Texture of the reſidue. The Experiment I have made ſeveral wayes, but one of the lateſt and beſt I have uſ'd is this: Take one part of good Sea-ſalt well dry'd and powder'd, and put to it double its weight of good *Aqua fortis* or ſpirit of Nitre, then haveing kept it (if you have time) for ſome while in a previous digeſtion, diſtil it over with a ſlow fire in a Retort or a low Body, till the remaining Matter be quite dry, and no more; for this ſubſtance that will remain in the bottom of the Glaſſe is the thing that is ſought for.

This Operation being performable in a moderate fire, and the Bodies themſelves being almoſt of an incorruptible nature, one would ſcarce think, that ſo ſlight a matter ſhould produce any Change in them; but yet I found, as I expected, theſe notable Mutations of Qualities effected by ſo unpromiſing a way.

For in the firſt place we may take notice, that the Liquor that came over was no longer an *Aqua fortis*, or ſpirit of Nitre, but an *Aqua Regis*, that

that was able to dissolve Gold, which *Aqua fortis* will not meddle with, and will not dissolve Silver, as it would have done before, but will rather, as I have purposely try'd, precipitate it out of *Aqua fortis*, if that Menstruum have already dissolv'd it: but this Change belonging not so properly to the substance it self I was about to consider, I shall not here insist on it.

2. Then, the Taste of this Substance comes by this Operation to be very much alter'd. For it hath not that strong saltnesse that it had before, but tasts far milder, and though it relish of both, affects the Palate much more like Salt-petre, then like common salt.

3. Next, whereas this last nam'd Body is of very difficult Fusion, our factitious salt imitates salt-petre in being very fusible, and it will, like Nitre, soon melt, by being held in the flame of a Candle.

4. But to proceed to a more considerable *Phænomenon*, 'tis known, that Sea-salt is a Body, that doth very much resist the fire, when once by being brought to Fusion, it hath been forc'd to let go that windy substance, that makes unbeaten salt crackle in the Fire, and so by blowing it accidentally increase it. 'Tis also known, that acid spirits, as those of Salt, Vitriol, Nitre, Vinegar, *&c.* are not onely not inflammable themselves, but hinderers of inflammation in other Bodies; and yet my conjecture leading me to expect, that by this Operation,

I ſhould be able to produce out of two unin-flammable Bodies a third, that would be eaſily inflammable, I found upon Tryal not onely that ſmall Lumps of this ſubſtance, caſt upon quick and well blown coals, though they did not give ſo blew a flame as Nitre, did yet, like it, burn away with a copious and vehement flame. And, for further Tryal, having melted a pretty quantity of this tranſmuted Sea-ſalt in a Crucible, by caſting upon it little fragments of well kindled Charcoal, it would, like Nitre, preſently be kindled, and afford a flame ſo vehement and ſo dazling, that one that had better Eyes then I, and knew not what it was, complain'd, that he was not able to ſupport the ſplendor of it. Nor were all its inflammable parts conſum'd at one deflagration: for by caſting in more fragments of well kindled Coal, the Matter would fall a puffing, and flame afreſh for ſeveral times conſecutively, according to the quantity that had been put into the Crucible.

5. But this it ſelf was not the chief diſcovery I deſign'd by this Experiment. For I pretended hereby to deviſe a way of turning an acid ſalt into an *Alkaly*, which ſeems to be one of the greateſt and difficulteſt Changes, that is rationally to be attempted among durable and inanimate Bodies. For 'tis not unknown to ſuch Chymiſts as are any thing inquiſitive and heedful, how vaſt a difference there is between acid Salts, and thoſe that are made by the combuſtion

combuſtion of Bodies, and are ſometimes call'd Fix'd, ſometimes Alkalizate. For whereas ſtrong Lixiviums (which are but ſtrong ſolutions of *Alkalys*) will readily enough diſſolve common Sulphur, and divers other Bodies abounding with Sulphur; even thoſe highly acid Liquors, *Aqua fortis* and *Aqua Regis*, though ſo corroſive, that one will diſſolve Silver and the other Gold it ſelf, will let Brimſtone lye in them undiſſolv'd I know not how long; though ſome ſay, that in proceſſe of time there may be ſome Tincture drawn by the Menſtruum from it, which yet I have not ſeen try'd; and though it were true, would yet ſufficiently argue a great diſparity betwixt thoſe acid ſpirits and ſtrong Alkalizate ſolutions, which will ſpeedily diſſolve the very maſſe of common Sulphur. Beſides 'tis obſerv'd by the inquiſitive Chymiſts, nor does my Experience contradict it, that the Bodies, that are diſſolv'd by an acid Menſtruum, may be precipitated by an Alkalizate; and on the contrary, ſolutions made by the latter may be precipitated by the former. Moreover as Litharge diſſolv'd in ſpirit of Vinegar will be precipitated by the Oyl of Tartar *per Deliquium* or the ſolution of its Salt; and, on the contrary, Sulphur or Antimony diſſolv'd in ſuch a ſolution will be precipitated out of it by the ſpirit of Vinegar, or even common Vinegar. Moreover, Acids and Alkalizates do alſo differ exceedingly in taſte,

and in this greater disparity, that the one is volatile, and the other fix'd, besides other particulars not necessary here to be insisted on. And indeed if that were true which is taught in the Schools, that there is a natural enmity, as well as disparity betwixt some Bodies, as between Oyly and waterish ones, the Chymists may very speciously teach, (as some of them do) that there is a strange contrariety betwixt Acid and Alkalizate Salts; as when there is made an Affusion of oyl of Tartar upon *Aqua Regis* or *Aqua fortis*, to precipitate Gold out of the one, and Silver out of the other, their mutual Hostility seems manifestly to shew it self, not onely by the noise and heat and fume, that are immediately excited by their conflict, but by this most of all, that afterwards the two contending Bodies will appear to have mutually destroy'd one another, both the sowr Spirit and the fixt Salt having each lost its former Nature in the scuffle, and degenerated with its Adversary into a certain third substance, that wants several of the Properties both of the sowr Spirit and the *Alkaly*. Now to apply all this to the Occasion, on which I mention'd it, how distant and contrary soever the more inquisitive of the latter Chymists take *Acid* and *Fixed* Salts to be; yet I scarce doubted, but that, by our Experiment, I should from acid salts obtain an *Alkaly*, and accordingly having, by casting in several bits of well kindled coal, excited in the

the melted Maſſe of our tranſmuted Salt as many Deflagrations as I could, and then giving it a pretty ſtrong fire to drive away the reſt of the more fugitive parts, I judg'd, that the remaining Maſſe would be (like the fix'd Nitre I have elſewhere mention'd) of an Alkalizate nature, and accordingly having taken it out, I found it to taſt, not like Sea-ſalt, but fiery enough upon the Tongue, and to have a Lixiviate reliſh. I found too, that it would turn Syrup of Violets into a greeniſh colour, that it would precipitate a Limpid ſolution of Sublimate, made in fair water, into an Orange tawny Powder. I found, that it would, like other fix'd ſalts, produce an Ebullition with acid ſpirits, and even with ſpirit of ſalt it ſelf, and concoagulate with them. Nor are theſe themſelves all the wayes I took to manifeſt the Alkalizate Nature of our tranſmuted Sea-ſalt.

I did indeed conſider at firſt, that it might be ſuſpected, that this new Alkalizateneſſe might proceed from the Aſhes of the injected coals, the Aſhes of Vegetables generally containing in them more or leſſe of a fix'd Salt. But when I conſider'd too, that a pound of Charcoal, burn'd to Aſhes, is wont to yield ſo very little Salt, that the injected fragments of Coal (though they had been, which they were not) quite burn'd out in this Operation would ſcarce have afforded two or three grains of ſalt,

(perhaps not halfe ſo much) I ſaw no reaſon at all to believe, that in the whole Maſs I had obtained (and which was all, that was left mee of the Sea-ſalt, I had firſt imployed,) it was nothing but ſo inconſiderable a proportion of Aſhes, that exhibited all the *Phænomena* of an *Alkaly*.

And for further confirmation both of This, and what I ſaid a little before, I ſhall adde, that to ſatisfie my ſelfe yet more, I pour'd upon a pretty quantity of this Lixiviate ſalt a due proportion of *Aqua fortis*, till the hiſſing and ebullition ceaſed, and then leaving the fluid Mixture for a good while to coagulate, (which it did very ſlowly) I found it at length to ſhoot into ſaline Chryſtals, which though they were not of the figure of Nitre, did yet, by their inflammability and their bigneſſe, ſufficiently argue, that there had been a Conjunction made betwixt the Nitrous ſpirit, and a conſiderable proportion of *Alkaly*.

I conſider'd alſo, that it might be ſuſpected, that in our Experiment 'twas the Nitrous Corpuſcles of the *Aqua fortis*, that, lodging themſelves in the little rooms deſerted by the ſaline Corpuſcles of the Sea-ſalt, that paſſed over into the Receiver, had afforded this *Alkaly*; as common Salt-petre, being handled after ſuch a manner, would leave in the Crucible a fix'd or *Alkalizate* Salt. But to this I anſwer, that as the Sea-ſalt, which was not driven over by ſo mild a Diſtilla-

Diſtillation, and ſeem'd much a greater part then that which had paſs'd over, was far from being of an *Alkalizate* nature: ſo the Nitrous corpuſcles that are preſum'd to have ſtaid behind, were, whilſt they compoſ'd the ſpirit of Nitre, of an highly volatile and acid nature, and conſequently of a nature directly oppoſite to that of *Alkalys*; and if by the addition of any other ſubſtance, that were no more *Alkalizate* then Sea-ſalt, an *Alkaly* could be obtain'd out of ſpirit of Nitre or *Aqua fortis*, the producibleneſſe of an *Alkaly* out of Bodies of another nature might be rightly thence inferr'd: ſo that however it appears that by the intervention of our Experiment, two ſubſtances that were formerly acid are turn'd into one, that is manifeſtly of an *Alkalizate* nature, which is That we would here evince.

Perhaps it may (*Pyrophilus*) be worth while to ſubjoyn, that to proſecute the Experiment by inverting it, we drew two parts of ſtrong ſpirit of Salt from one of purifi'd Nitre, but did not obſerve the remaining Body to be any thing neer ſo conſiderably chang'd as the Sea-ſalt, from which we had drawn the ſpirit of Nitre; ſince though the ſpirit of Salt that came over did (as we expected) bring over ſo many of the corpuſcles of the Nitre, that being heated, it would readily enough diſſolve foliated Gold; yet the Salt that remain'd in the Retort being put upon quickcoals did flaſh away with a vehement

and

and halituous flame, very like that of common Nitre.

Experiment VI.

I Come now (*Pyrophilus*) to an Experiment, which, though in some things it be of kin to that which I have already taught you concerning the changing of Sea-salt by *Aquafortis*, will yet afford us diverse other instances, to shew how upon the change of Texture in bodies there may arise diverse new qualities, especially of that sort, which, because they are chiefly produc'd by Chymistry, and are wont to be consider'd by Chymists, if not by them onely, may in some sence be call'd Chymical.

The Body which, partly whilst we were preparing it, and partly when we had prepar'd it, afforded us these various *Phænomena*, either is the same that *Glauberus* means by his *Sal mirabilis*, or at least seems to be very like it: and whether it be the same or no, its various and uncommon properties make it very fit to have a place allow'd it in this Treatise. Though of the many tryals I made with it, I can at present find no more among my loose Papers, then that following part of it that I wrot some years ago to an ingenious Friend, who I know will not be displeas'd, if, to save my self some time and the trouble of examining my memory, I annex the following Transcript of it.

To

[To give you a more particular account of what I writ to you from *Oxford* of my tryals about *Glauber's* Salt, though I dare not say that I have made the self same thing, which he cals his *Sal mirabilis*, because he has describ'd it so darkly and ambiguously, that tis not easie to know with any certainty what he means; yet whether or no I have not made Salt, that, as far as I have yet try'd it, agrees well enough with what he delivers of His, and therefore is like to prove either his *Sal mirabilis*, or almost as good a one, I shall leave you to judge by this short Narrative.

The strange things that the Industrious *Glauber's* Writings have invited men to expect from his *Sal mirabilis*, in case he be indeed possess'd of such a thing, and the enquiries of diverse eminent men, who would fain learn of me what I thought of its reality and nature, invited me, the next opportunity I got, to take into my hands his *Pars altera miraculi mundi*, whose Title you know promises a description of this *Sal artis mirificum*, as he is pleas'd to call it. But, I confesse, I did not read it neer all over, because a great part of it is but a transcription of several entire Chapters out of *Paracelsus*, and I perceiv'd that much of the rest did, according to the custome of Chymical writings, more concern the Author then the Subject; wherefore looking upon his process of making his *Sal mirabilis*, I soon perceiv'd he had no mind to make it com-

mon

mon, ſince he onely bids us upon two parts of common Salt diſſolv'd in common water to pour *A*, without telling us what that *A* is, wherefore reading on in the ſame proceſſe, and finding that he tells us, that with *B* (which he likewiſe explaines not at all, nor determines the quantity of it) one may make an *Aqua fortis*, it preſently call'd into my mind, that ſome years before having had occaſion to make many Tryals, mention'd in other Tracts of mine, with oyl of Vitriol and Salt-petre, I did among other things make a red ſpirit of Nitre, by the help onely of oyl of Vitriol; remembring this (I ſay) I reſorted to one of my *Carneades's* Dialogues*, and reviewing that Experiment as I have ſet it down, I concluded, that though I had not diſſolv'd the Salt-petre in water, as *Glauber* doth his common ſalt; yet ſince on the other ſide I made uſe of external fire, 'twas probable I might this way alſo get a Nitrous ſpirit, though not ſo ſtrong. And though by calling the Liquor, that muſt make an *Aqua fortis*, *B*, whereas he had call'd that, which is to make his ſpirit of Salt and *Sal mirabilis*, *A*, he ſeem'd plainly to make them different things, yet relying on the Experiment I had made, and putting to a ſolution of Nitre as much of the Oyl of Vitriol as I had taken laſt, though That be double the quantity he preſcribes for the making of his *Sal mirabilis*, I obtaind, out of a low

* See the Sceptical Chymiſt.

glaſſe

glaſſe Body and Head in Sand an indifferent good *ſpiritus Nitri*, that even before Rectification would readily enough diſſolve Silver, though it were diluted with as much of the common water wherein Salt-petre had been diſſolv'd, as amounted at leaſt to double or treble the weight of the Nitrous parts; the remaining Matter being kept in the fire till it was dry afforded us a Salt eaſily reducible (by Solution in fair water and Coagulation) into Chryſtalline Grains, of a nature very differing both from crude Nitre, and from fixt Nitre, and from oyl of Vitriol. For it coagulated into pretty big and well ſhap'd Grains, which, you know, fix'd Nitre and other *Alkalizate* Salts are not wont to do; and theſe Graines were not, like the Chryſtals of Salt-petre it ſelf, long and Hexaedrical, but of another figure, not eaſie nor neceſſary to be here deſcribed.

Beſides, this Vitriolate Nitre (if I may ſo call it) would not eaſily, if at all, flow in the Air as fixt Nitre is wont to do: Moreover, it was eaſily enough fuſible by heat, whereas fixt Nitre doth uſually exact a vehement fire for its Fuſion; and though crude Salt-petre alſo melts eaſily, yet to ſatisfie you how differing a ſubſtance this of ours was from That, we caſt quick coals into the Crucible, without being at all able to kindle it. Nay, and when for further tryal we threw in ſome Sulphur alſo, though it did flame away it ſelf, yet it did not

ſeem

ſeem to kindle the ſalt, that was hot enough to kindle It; much leſſe did it flaſh, as Sulphur is wont on ſuch occaſions to make Salt-petre do. Add to all this, that a parcel of this white ſubſtance, being without Brimſtone made to flow for a while in a Crucible with a bit of Charcoal for it to work upon, grew manifeſtly and ſtrongly ſented of Sulphur, and acquir'd an *Alkalizate* taſt, ſo that it ſeem'd almoſt a coal of fire upon the tongue, if it were lick'd before it imbib'd any of the aires moiſture, and (which many perhaps will, though I do not, think ſtranger) obtain'd alſo a very red colour; which recall'd to my mind that *Glauber* mentions ſuch a change obſervable in his ſalt made of common ſalt, upon whoſe account he is pleaſ'd to call ſuch a ſubſtance his *Carbunculus*.

Being invited by this ſucceſſe to try whether I could make his *Sal mirabilis*, notwithſtanding his intimating, as I lately told you, that it is done with a differing Menſtruum from that wherewith the Salt-petre is to be wrought upon; I obſerv'd, that where he points at a way of making his ſalt in quantity without breaking the veſſels, he preſcribes, that the materials be diſtill'd in veſſels of pure Silver; whence I conjectur'd, that twas not *Aqua fortis* or ſpirit of Nitre, that he imploy'd to open his Sea-ſalt: and that conſequently, ſince common ſpirit of ſalt was too weak to effect ſo great a change as the Experiment requires, twas very probable,

that

that he imploy'd oyl of Sulphur or of Vitriol, which will ſcarce at all fret unalloy'd Silver. And however I concluded, that whatſoever the event ſhould prove, it could not but be worth the while to try what operation ſuch a Menſtruum would have upon Sea-ſalt, as I was ſure had ſuch a notable one upon ſalt-petre. And I remember, that formerly making ſome Experiments about the differing manners of diſſolution of the ſame concrete by ſeveral Liquors, I found, that oyl of Vitriol diſſolves Sea-ſalt in a very odd way, (which you will find mention'd among my promiſcuous Experiments) wherefore pouring upon a ſolution of Bay-ſalt made in but a moderate proportion of water oyl of Vitriol to the full weight of the dry ſalt, and abſtracting the Liquor in a glaſſe Cucurbite plac'd in Sand, I obtain'd without ſtreſſe of fire, beſides phlegm, good ſtore of a Liquor, which by the ſmell and taſt ſeem'd to be ſpirit of Salt. And to ſatisfie my ſelf the better, mingling a little of it with ſome of the ſpirit of Nitre lately mention'd, I found the mixture, even without the aſſiſtance of heat, to diſſolve crude Gold. And having for further tryals ſake pour'd ſome of it upon ſpirit of fermented Urine, till the Affuſion ceaſ'd to produce any conflict, and having afterwards gently evaporated away the ſuperfluous moiſture, there did, as I expected, ſhoot in the remaining liquor a Salt figur'd like Combs and Feathers, thereby diſcloſing it ſelf to be much

of

of the nature of Sal Armoniack, such as I elsewhere relate my having made, by mingling spirit of Urine with spirit of common Salt made the ordinary way.]

This (*Pyrophilus*) is all I can find at present of that Account, of which I hop'd to have found much more; but you will be the more unconcern'd, for my not adding divers other things, that, I remember, I try'd, as well before and after the writing the above-transcrib'd Paper, (as particularly, that I found the Experiment sometimes to succeed not ill, when I distill'd the Oyl of Vitriol and Sea-salt together, without the intervention of Water, (whereby much time was sav'd) and also when I imploy'd Oyl of Sulphur, made with a Glass Bel, instead of Oyl of Vitriol) if I inform You, that afterwards I found, that *Glauber* himself, in some of his subsequent pieces, had deliver'd more intelligibly the Way of making what he, without altogether so great a Brag, as most think, cals his *Sal mirabilis*, (which yet some very ingenious Readers of his Writings have come to Us to teach them) and that those Experiments of his about it, which I was able to make succeed, (for some I was not, and some I did not think fit to try) you will find, together with those of my Own, in more proper places of other Papers. Onely, to apply what hath been above related to my present purpose, I must not here pretermit a couple of Observations.

And

And first we may take notice of the power, that Mixtures, though they seem but very slight and consist of the smallest number of ingredients, may, if they make great changes of Texture, have, in altering the nature and qualities of the compounding Bodies. For in our (above recited) case, though Sea-salt being a body considerably fix'd requires a naked fire to be elevated even by the help of copious additaments of beaten Bricks or Clay, &c. to keep it from fusion, yet the saline Corpuscles are distill'd over in a moderate fire of Sand, whilst the oyl of Vitriol, by whose intervention they acquire this volatility, though it be not (like the other) a gross, or, as the same Chymist speaks, corporeal salt, but a Liquor that has been already distill'd, is yet by the same operation so fix'd, as to stay behind not onely in the Retort, but, as I have sometimes purposely try'd, in much considerabler heats then That needs in this Experiment be expos'd to. Nor onely is the oyl of Vitriol made thus far fix'd, but it is otherwise also no lesse chang'd. For when the remaining Salt has been expos'd to a competent heat, that it may be very dry and white, to be sure of which I several times do, when the Distillation is ended, keep the remaining Masse (taken out of the Retort and beaten) in a Crucible among quick coals, you shall have a considerable quantity (perhaps near as much as the Sea-salt you first imploy'd) of a substance, which, though not

insipid, has not at all the taſt of Sea-ſalt, or any other pungent one, and much leſſe the highly corroſive acidity of oyl of Vitriol.

And the mention of this ſubſtance leads me to the ſecond particular I intended to take notice of, which is a *Phænomenon* to confirme what I formerly intimated, that notwithſtanding the regular and exquiſite figures of ſome Salts, they may by the addition of other Bodies be brought to conſtitute Chryſtals of very differing and yet of curious ſhapes. For if you diſſolve the hitherto mention'd *Caput mortuum* of Sea-ſalt (after you have made it very dry, and freed it from all pungency of taſt) in a ſufficient quantity of fair water, and having filtrated the ſolution ſuffer the diſſolv'd body leiſurely to coagulate, you will probably obtaine, as I have often done, Chryſtals of a far greater Tranſparency, then the Cubes wherein Sea-ſalt is wont to ſhoot, and of a ſhape far differing from theirs, though oftentimes no leſſe curious then that of thoſe Cubes; and, which makes mainely for my preſent purpoſe, I have often obſerv'd thoſe finely figur'd Chryſtals to differ as much in ſhape from one another, as from the Graines of common ſalt. And indeed I muſt not on this occaſion conceal from you, that whether it be to be imputed to the peculiar nature of Sea-ſalt, or (which I judg much more probable) to the great diſparities to be met with in Liquors, that do all of them paſſe for oyl of Vitriol, whether

(I ſay) it be to this or to ſome other cauſe, that the Effect is to be imputed, I have found my attempts, to make the beſt ſort of *Sal mirabilis*, ſubject to ſo much uncertainty, that though I have diverſe times ſucceeded in them, I have found ſo little Uniformity in the ſucceſſe, as made me reckon this Experiment amongſt Contingent ones, and almoſt weary of medling with it.

*Experiment VII.**

I Remember, *Pyrophilus*, I once made an Experiment, which, if I had had the opportunity to repeat, and had done ſo with the like ſucceſſe, I ſhould be tempted to look upon it, though not as a Lucriferous Experiment, (for tis the quite contrary) yet as ſo lucriferous a one, as, how much ſoever it may ſerve to recommend Chymiſtry it ſelf, may no leſſe diſpleaſe envious Chymiſts, who will be troubled both that one who admits not their principles ſhould deviſe ſuch a thing, and that having found it, he ſhould not (Chymiſt like) keep it ſecret.

But to give you a plain and naked account of

* Though this VII. Experiment, being conſiderable and very pertinent, the Author thought fit to mention it, ſuch as it is here delivered, when he writ but to a private friend; yet after he was induc'd to publiſh theſe Papers, twas the (now raging) Plague, which drove him from the accommodations requiſite to his purpoſe, that fruſtrated the deſign he had of firſt repeating that part of the Experiment which treats of the deſtruction of Gold: for as for that part which teaches the Volatilization of it, He had tryed That often enough before.

this matter, that you may be able the better to judge of it, and, if you pleaſe, to repeat it, I will freely tell you, that ſuppoſing all Metals as well as other Bodies to be made of one Catholick Matter common to them all, and to differ but in the ſhape, ſize, motion or reſt, and texture of the ſmall parts they conſiſt of, from which affections of Matter the Qualities, that difference particular bodies, reſult, I could not ſee any impoſſibility in the nature of the thing, that one kind of Metal ſhould be tranſmuted into another; (that being in effect no more, then that one parcel of the Univerſal Matter, wherein all Bodies agree, may have a texture produc'd in it, like the texture of ſome other parcel of the matter common to them both.)

And having firſt ſuppoſ'd this, I further conſider'd, that in a certain Menſtruum which, according to vulgar Chymiſts doctrine, muſt be a worthleſſe Liquor, according to my apprehenſion there muſt be an extraordinary efficacy in reference to Gold, not onely to diſſolve and otherwiſe alter it, but to injure the very texture of that ſuppoſedly immutable Metal.

The Menſtruum then I choſe to try whether I could not diſſolve Gold with is made by pouring on the rectify'd oyl of the butter of Antimony as much ſtrong ſpirit of Nitre, as would ſerve to precipitate out of it all the *Bezoarticum Mineraie*, and then with a good ſmart fire diſtilling off all the Liquor that would come over, and

and (if need be) Cohobating it upon the Antimonial powder. For though diverſe Chymiſts that make this Liquor throw it away, upon preſumption that becauſe of the Ebullition, that is made by the Affuſion of the ſpirit to the Oyl and the conſequent precipitation of a copious powder, the liquors have mutually deſtroy'd or diſarm'd each other; yet my Notions and Experience of the nature of ſome ſuch mixtures invite me to prize this and give it the name of *Menſtruum peracutum.*

Having then provided a ſufficient quantity of this Liquor, (for I have obſerv'd that Gold ordinarily requires a far more copious Solvent then Silver) we took a quantity of the beſt Gold we could get, and melted it with three or four times its weight of Copper, which Metal we chooſe rather then that which is more uſual among Refiners, Silver, that there may be the leſſe ſuſpicion that there remain'd any Silver with the Gold after their ſeparation; this mixture we put into good *Aqua fortis* or ſpirit of Nitre, that all the Copper being diſſolv'd, the Gold might be left pure and finely powder'd at the bottom; this Operation with *Aqua fortis* being accounted the beſt way of refining Gold that is yet known, and not ſubject like Lead to leave any Silver with it, ſince the *Aqua fortis* takes up that Metal. And for greater ſecurity, we gave the Powder to an ancient Chymiſt, to boile ſome more of the Menſtruum upon it,

without communicating to him our design. This highly refin'd Gold being, by a competent degree of heat brought, as is usual, to its native colour and lustre, we put to it a large proportion of the *Menstruum peracutum*, (to which we have sometimes found cause to adde a little spirit of Salt to promote the solution) wherein it dissolves slowly and quietly enough; and there remain'd at the bottom of the Glasse a pretty quantity (in shew though not in weight) of white Powder, that the Menstruum would not touch, and, if I much misremember not, we found it as indissoluble in *Aqua Regis* too. The solution of Gold being abstracted and the Gold again reduc'd into a Body did, upon a second solution, yield more of the white Powder, but not (if I remember aright) so much as at the first; now having some little quantity of this Powder, twas easie with Borax or some other convenient Flux to melt it down into a Metal, which Metal we found to be white like Silver, and yielding to the hammer, if not to a lesse pressure, and some of it being dissolv'd in *Aqua fortis* or spirit of Nitre did, by the odious bitternesse it produc'd, sufficiently confirm us in our expectation, to find it true Silver.

I doubt not but you will demand, *Pyrophilus*, why I did not make other tryals with this Factitious Metal, to see in how many other qualities I could verifie it to be Silver, but the quantity I recover'd after fusion was so small, some

of

of it perhaps being left either in the Flux or in the Crucible, that I had not wherewithal to make many Tryals, and being well enough satisfied by the visible Properties and the Taſt peculiar to Silver, both that it was a Metal, and rather Silver then any other, I was willing to keep the reſt of it for a while, as a Rarity, before I made further Tryals with it; but was ſo unfortunate, as with it to looſe it in a little Silver Box, where I had ſomething of more Value, and poſſibly of more Curioſity.

You will alſo ask, why I repeated not the Experiment? to which I ſhall anſwer, that, beſides that one may eaſily enough faile in making the Menſtruum fit for my purpoſe, I did, when I had another Opportunity, (for I was long without it) make a Second Attempt; and having, according to the above mention'd Method, brought it ſo far, that there remain'd nothing but the melting of the White Powder into Silver, when having waſhed it, I had layd it upon a piece of white Paper by the fires ſide to dry, being ſuddenly call'd out of my Chamber, an ignorant Maid, that in the mean time came to dreſſe it up, unluckily ſwept this Paper, as a foul one, into the fire: which Diſcouragement together with multiplicity of Occaſions have made me ſuſpend the purſuit of this Experiment till another Opportunity. But in the mean time I was confirm'd in ſome part of my Conjecture by theſe things.

The first, by finding that with some other Menstruums which I try'd, and even with good *Aqua Regis* it self, I could obtain from the very best Gold I dissolv'd in them some little quantity of such a white powder, as I was speaking of; but in so very small a proportion to the dissolv'd Gold, that I had never enough of it at once to think it worth prosecuting Tryals with.

The other was this, that a very experienc'd Mineralist, whom I had acquainted with part of what I had done, assur'd me, that an eminently Learned and Judicious person that he nam'd to me had, by dissolving Gold in a certain kind of *Aqua Regis*, and after by reduction of it into a Body, redissolving it again, and repeating this operation very often, reduc'd a very great if not much the greater part of an ounce of Gold into such a white powder.

And the third thing that confirmed me was the proof given me by some Tryals that I purposely made, that the *Menstruum peracutum* I imploy'd had a notable operation upon Gold, and would perform some things (one of which we shall by and by mention) which judicious men, that play the great Criticks in Chymistry, do not think feasible: so that there seems no greater cause to doubt, that the above mention'd Silver was really obtain'd out of the pure Gold, then onely this, that men have hitherto so often in vain attempted to make a real Transmutation of Metals, (for the better or for the worse,) and to destroy the most fix'd and com-

pacted Body of Gold, that the one is look'd upon as an Unpracticable Thing, and the other as an Indeſtructible Metal.

To reflect then a little upon what we have been relating, if we did not miſtake nor impoſe upon our ſelves, (I ſay, upon our Selves, the Project being our own, and purſued without acquainting any body with our Aime) it may afford us very conſiderable Conſequences of great moment.

And in the Firſt place, it ſeems probably reducible from hence, that however the Chymiſts are wont to talke irrationally enough of what they call *Tinctura Auri* and *Anima Auri*; yet, in a ſober ſenſe, *ſome ſuch thing* may be admitted; I ſay, *ſome ſuch thing*, becauſe as on the one hand, I would not countenance their wild Fancies about theſe matters, ſome of them being as unintelligible, as the Peripateticks ſubſtantial Forms, ſo on the other hand, I would not readily deny, but that there may be ſome more noble and ſubtle Corpuſcles, that being duely conjoyn'd with the reſt of the Matter, whereof Gold conſiſts, may qualifie that Matter to look Yellow, to reſiſt *Aqua fortis*, and to exhibit thoſe other peculiar *Phænomena*, that diſcriminate Gold from Silver, and yet theſe Noble parts may either have their Texture deſtroy'd by a very piercing Menſtruum, or by a greater congruity with its corpuſcles, then with thoſe of the remaining part of the Gold, may

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ſtick more cloſe to the former, and by their means be extricated and drawn away from the latter. As when (to explain my meaning by a groſſe Example) the Corpuſcles of Sulphur and Mercury do, by a ſtrict Coalition, aſſociate themſelves into the Body we call Vermilion, though theſe will riſe together in Sublimatory Veſſels, without being divorc'd by the fire, and will act, in many caſes, as one Phyſical Body: yet tis known enough among Chymiſts, That if You exquiſitely mix with it a due proportion of Salt of Tartar, the parts of the *Alkaly* will aſſociate themſelves more ſtrictly with thoſe of the Sulphur, then theſe were before aſſociated with thoſe of the Mercury, whereby You ſhall obtain out of the Cinnabar, which ſeem'd intenſely red, a real Mercury, that will look like fluid Silver. And this Example prompts me to mind You, (*Pyrophilus*) that, at the beginning of this Paragraph, I ſaid no more, then that the Conſequence, I have been deducing, might probably be inferr'd from the Premiſes. For as 'tis not abſurd to think, that our Menſtruum may have a particular Operation upon ſome noble, and (if I may ſo call them) ſome tinging parts of the Gold, ſo it is not impoſſible, but that the Yellowiſhneſſe of that rich Metal may proceed not from any particular Corpuſcles of that Colour, but from the Texture of the Metal; as in our lately mention'd Example, the Cinnabar was highly Red, though

the

the Mercury, it consisted of, were Silver-coloured, and the Sulphur but a pale Yellow; and consequently, the Whiteneſſe and other Changes produc'd in the new Metal we obtain'd may be attributed not to the Extraction of any tinging Particles, but to a change of Texture, whereon the Colour as well as other Properties of the Gold did depend. But That, which made me unwilling to reject the way I firſt propoſed of explicating this change of Colour was, That a Mineraliſt of great Veracity hath ſeveral times aſſur'd me, that a known Perſon in the Relators Country, the Netherlands, got a great deal of Money by the way of Extracting a Blew Tincture out of Copper, ſo as to leave the Body White; adding, that he himſelf, having procur'd from a friend (to ſatisfie his curioſity) a little of the Menſtruum, (whoſe chiefe Ingredients his friend communicated to him, and he to me) he did, as he was directed, diſſolve Copper in common *Aqua fortis*, to reduce it into ſmall parts, and then having kept the *Calx* of the Powder of this Copper for ſome hours in this Menſtruum, he perceiv'd, that the clear Liquor, which was weak in Taſte, did not diſſolve the Body of the Metal, but onely extract a blew Tincture, leaving behind a very White Powder, which he quickly reduc'd by Fuſion into a Metal of the ſame Colour, which he found as Malleable as before. Which I the leſſe wonder at, becauſe the Experienc'd

Chymiſt

Chymist *Johannes Agricola* in his Dutch Annotations upon *Poppius* mentions the making of a White and Malleable Copper in good quantities upon his own knowledge; and that of such a kind of Copper I have with pleasure made Tryal. I elsewhere relate. But of these matters we may possibly say more in a convenient place.

The Second thing that seems deducible from our former Narrative is, That however most (for I say not all) of the Judiciousest among the Chymists themselves, as well as among their Adversaries, believe Gold too fix'd and permanent a Body to be changeable by Art, insomuch that tis a receiv'd Axiom amongst many Eminent Spagyrists, that *facilius est aurum construere, quàm destruere*; yet Gold it self is not absolutely indestructible by Art, since Gold being acknowledg'd to be an Homogeneous Metal, a part of it was, by our Experiment, really chang'd into a Body, that was either true Silver, or at least a new kind of Metal very differing from Gold. And since tis generally confess'd, that among all the Bodies we are allow'd to observe near enough, and to try our skill upon, there is not any, whose Form is more strictly united to its Matter then that of Gold; and since also the Operation, by which the White Powder was produc'd, was made onely by a corrosive Liquor, without violence of Fire, it seems at least a very probable Inference, That there

there is not any Body of ſo conſtant and durable a Nature, but that, notwithſtanding its perſiſting inviolated in the midſt of divers ſenſible Diſguiſes, its Texture and conſequently its Nature may be really deſtroy'd, in caſe this more powerfull and appropriated Agent be brought by a due manner of Application to work upon the Body, whoſe Texture is to be deſtroy'd.

But this Matter we elſewhere handle, and therefore ſhall now proceed to the Laſt and chief Conſectaries of our Experiment.

Thirdly then, it ſeems deducible from what we have deliver'd, that there may be a real Tranſmutation of one Metal into another, even among the perfecteſt and nobleſt Metals, and that effected by Factitious Agents in a ſhort time, and, if I may ſo ſpeak, after a Mechanical manner. I ſpeak not here of Projection, whereby one part of an Aurifick Powder is ſaid to turn I know not how many hundred or thouſand parts of an ignobler Metal into Silver or Gold, not onely becauſe, though Projection includes Tranſmutation, yet Tranſmutation is not all one with Projection, but farre eaſier then it: but chiefly becauſe 'tis not in this Diſcourſe you are to expect what I can ſay and do think concerning what Men call the Philoſophers Stone. To reſtrain my ſelfe then to the Experiment we are conſidering, that ſeems to teach us, that at leaſt among inanimate Bodies, the nobleſt and conſtanteſt

conſtanteſt ſort of Forms are but peculiar contrivances of the Matter, and may, by Agents that work but Mechanically, that is, by locally moving the parts, and changing their Sizes, Shape, or Texture, be generated and deſtroy'd; ſince we ſee, that in the ſame parcel of Metalline Matter, which a little before was true and pure Gold, by having ſome few of its parts withdrawn, and the reſt tranſpoſ'd, or otherwiſe alter'd in their ſtructure, (for there appears no token, that the Menſtruum added any thing to the Matter of the produc'd Silver) or by both theſe wayes together, the Form of Gold or that peculiar Modification which made it Yellow, indiſſoluble in *Aqua fortis*, *&c.* is aboliſh'd, and from the new Texture of the ſame Matter, there ariſes that new Forme or Convention of Accidents, from which we call a Metal Silver; and ſince Ours was not onely diſſoluble in *Aqua fortis*, but exhibited that exceſſively bitter Taſte, which is peculiar to Silver, there ſeems no neceſſity to think, that there needs a diſtinct Agent, or a particular Action of a Subſtantial Form, to produce in a Natural Body the moſt peculiar and diſcriminating Properties. For twas but the ſame Menſtruum, devoid of Bitterneſſe, that by deſtroying the texture of Gold chang'd it into another, upon whoſe account it acquir'd at once both Whiteneſſe in colour, Diſſolubleneſſe in *Aqua fortis*, and aptneſſe to compoſe a bitter Body with it, and I know

not

not how many other new Qualities are attributed.

I know tis obvious to object, that tis no very thrifty way of Transmutation, instead of Exalting Silver to the condition of Gold, to degrade Gold to the condition of Silver. But a Transmutation is nevertheless more or less real, for being or not being Lucriferous, and since that may inrich a Brain, that may impoverish a Purse, I must look upon your humour as that of an Alchymist, rather then of a Philosopher, if I durst not expect that the Instructiveness in such an Experiment will suffice to recommend it to You. And if I could have satisfied my self, that good Authors are not mistaken about what they affirm of the Transmutation of Iron into Copper, though the charge and pains consider'd, it be a matter of no Gaine, yet I should have thought it an Experiment of great Worth, as well as the Transmutation of Silver into Gold. For 'tis no small matter to remove the Bounds, that Nature seems very industriously to have set to the Alterations of Bodies; especially among those Durable and almost Immortal Kinds, in whose Constancy to their first Forms Nature seems to have design'd the shewing her self invincible by Art.

I should here (*Pyrophilus*) conclude what I have to say of the Experiment, that hath already so long entertain'd us, by recommending to You the repetition of what I had not the Opportunity

portunity to try above once from end to end, were it not, that I remember ſomething I ſaid about the *Menſtruum peracutum*, may ſeem to import a Promiſe of communicating to You ſomething of the Efficacy of that Liquor upon Gold. And therefore partly for that reaſon, and partly to make ſure that the preſent Diſcourſe ſhall not be uninſtructive to You, I would adde, That though not onely the generality of Refiners and Mineraliſts but divers of the moſt Judicious Cultivators of Chymiſtry it ſelf hold Gold tobe ſo fix'd a Body, that it can as little be Volatiliz'd as Deſtroy'd, and that upon this ground, that the proceſſes of ſubliming or diſtilling Gold to be met within divers Chymical Books are either myſtical, or unpracticable, or fallacious; (in which Opinion I think them not much miſtaken) though this, I ſay, be the perſwaſion even of ſome Critical Chymiſts, yet, upon the juſt Expectation I had to find my Menſtruum very operative upon Gold, I attempted and found a way to Elevate it to a conſiderable height, by a farre leſſe proportion of Additament, then one that were not fully perſwaded of the poſſibility of Elevating Gold would imagine; and though I have indeed found, by two or three ſeveral Liquors, (eſpecially the *Aqua pugilum*, enigmatically deſcrib'd by *Baſilius*) that the Fixedneſſe of Gold is not altogether invincible, yet I found the Effect of theſe much inferior to that of our Mixture,

ture, touching which I ſhall relate to you the eaſieſt and ſhorteſt though not perhaps the very beſt manner of imploying it.

We take then the fineſt Gold we can procure, and having either granulated it or laminated it, we diſſolve it in a moderate heat with a ſufficient quantity of the *Menſtruum peracutum*; and having carefully decanted the Solution into a conveniently ſiz'd Retort, we very gently in a Sand-furnace diſtill off the *Menſtruum*, and if we have a mind to elevate the more Gold, we either pour back upon the remaining ſubſtance the ſame Menſtruum, or, which is better, rediſſolve it with freſh; the Liquor being abſtracted, we urge the remaining Matter by degrees of fire, and in no ſtronger a one then what may eaſily be given in a Sand-furnace, a conſiderable quantity of the Gold will be elevated to the upper part of the Retort, and either fall down in a Golden colour'd Liquor into the Receiver, or, which is more uſual, faſten it ſelf to the Top and Neck in the form of a yellow and reddiſh Sublimate, and ſometimes we have had the neck of the Retort inrich'd with good ſtore of large thin Chryſtals, not yellow but red, and moſt like Rubies, very glorious to behold; (though even theſe being taken out and ſuffer'd to lie a due time in the open air would looſe their ſaline Form, and run *per Deliquium* into a Liquor.) Nor ſee I any cauſe to doubt, but that by the Re-affuſions of freſh Menſtruum

upon the dry *Calx* of Gold that ſtayes behind, the whole body of the Metal may be eaſily enough made to paſſe through the Retort, though for a certain reaſon I forbore to proſecute the Experiment ſo far.

But here (*Pyrophilus*) I think my ſelf oblig'd to interpoſe a caution, as well as to give you a further information about our preſent Experiment. For firſt I muſt tell you, that though even learned Chymiſts think it a ſufficient proof of a true Tincture, that not onely the colour of the Concrete will not be ſeparated by Diſtillation, but the extracted liquor will paſſe over tincted into the Receiver; yet this ſuppoſition, though it be not unworthy of able men, may in ſome caſes deceive them. And next I muſt tell you, that whereas I ſcruple not in ſeveral Writings of mine to teach, that the Particles of ſolid & conſiſtent Bodies are not alwaies unfit to help to make up fluid ones, I ſhall now venture to ſay further, that even a Liquor made by diſtillation, how volatile ſoever ſuch liquors may be thought, may in part conſiſt of corpuſcles of the moſt compact and ponderous bodies in the World.

Now to manifeſt both theſe things, and to ſhew you withall the truth of what I elſewhere teach, *That ſome Bodies are of ſo durable a Texture, that their minute parts will retain their own nature, notwithſtanding variety of Diſguizes, which may impoſe not onely upon other men, but upon Chymiſts themſelves*; I will adde, that to proſecute

ſecute the Experiment, I dropp'd into the yellow liquor afforded me by the elevated Gold a convenient quantity of clean running Mercury, which was immediately colour'd with a golden colour'd Film, and ſhaking it too and fro, till the Menſtruum would guild no more, when I ſuppoſ'd the Gold to be all precipitated upon the Mercury, I decanted the clarifi'd Liquor, and mixing the remaining *Amalgam* (if I may ſo call it) of Gold and Mercury with ſeveral times its weight of Borax, I did as I expected, by melting them in a ſmall Crucible, eaſily recover the ſcatter'd particles of the elevated Metal, reduc'd into one little Maſſe or Bead of corporal or yellow (though perhaps ſomewhat paliſh) Gold. But yet whether the Gold that tinged the Menſtruum, might not, before the Metal was reduc'd or precipitated out of it, have been more ſuccesfully apply'd to ſome conſiderable pnrpoſes then a bare ſolution of Gold, that hath never been elevated, may be a queſtion which I muſt not in this place determine, and ſome other things that I have try'd about our elevated Gold, I have elſewhere taken notice of; onely this further uſe I ſhall here make of this Experiment, that whereas I ſpeak in other Papers, as if there may be a volatile Gold in ſome Oars and other Minerals, where the Mine-men do not find any thing of that Metal, I mention ſuch a thing upon the account of the paſt Experiment and ſome Analogies. And therefore as I

would not be underſtood to adopt what every Chymical Writer is pleaſ'd to fancy concerning Volatile Gold; ſo I think judicious men, that are not ſo well acquainted with Chymical operations, are ſometimes too forward to condemn the Chymiſts obſervations; not becauſe their opinions have nothing of Truth, but becauſe they have had the ill luck not to be warily enough propoſ'd. And to give an inſtance in the opinion, that ſome Minerals have a Volatile Gold, (and the like may be ſaid of Silver) I think I may give an account rational enough of my admitting ſuch a thing, by explicating it thus: that *as* in our Experiment, though after the almoſt total abſtraction of the Menſtruum, the remaining Body being true Gold and conſequently in its own nature fixt, yet it is ſo ſtrictly aſſociated with ſome volatile ſaline particles, that theſe being preſs'd by the fire carry up along with them the corpuſcles of the Gold, which may be reduc'd into a Maſſe by the admiſtion of Borax, or ſome other Body fitted to divorce the Corpuſcles of the Metal from thoſe that would elevate them, and to unite them into Graines, too big and ponderous to be ſublim'd; *ſo* in ſome Mineral Bodies there may be pretty ſtore of Corpuſcles of Gold ſo minute, and ſo blended with the unfix'd particles, that they will be carried up together with them by ſo vehement a heat, as is wont to be imploy'd to bring Oars, and even metalline maſſes to fuſion.

ſion. And yet it is not impoſſible, but that theſe Corpuſcles of Gold, that in ordinary fuſions fly away, may be detain'd and recover'd by ſome ſuch proper *additament*, as may *either* work upon and (to uſe a Chymical Term) mortifie the other parts of the Maſſe, without doing ſo upon the Gold; *or* by aſſociating with the Volatile and ignobler Minerals ſome way or other diſable them to carry away the Gold with them, as they otherwiſe may do; *or* by its fixedneſſe and cognation of nature make the diſperſ'd Gold imbody with it. On which occaſion I remember, that a very ingenious man deſiring my thoughts upon an Experiment, which he and ſome others that were preſent at it look'd upon as very ſtrange, namely, that ſome good Gold having for a certain tryal been cuppel'd with a great deal of Lead, inſtead of being advanc'd in colour, as in goodneſſe, was grown manifeſtly paler then before; my conjecture being that ſo great a proportion of Lead might contain diverſe particles of volatile Silver, which meeting with the fix'd body of the Gold by incorporating therewith was detain'd, was much confirm'd by finding upon enquiry, that the Gold inſtead of looſing its weight had it conſiderably increaſ'd; which did much better anſwer my gheſs, then it did their Expectation that made the Experiment and were much ſurpriz'd at the Event. But this is no fit place to proſecute the conſideration of the Ad-

ditaments, that may be us'd to unite and fix the particles of the nobler Metals blended with volatile bodies; though perhaps what hath been said may afford some Hint about the matter, as well as some Apology for the Chymical Term, Volatile Gold: the possibility of which, I presume, we have evinc'd by the latter part of this Experiment, (in which I am sorry I cannot remember the proportion of the remaining Salts that were able to elevate the Gold) for That *I* have several times made, and therefore dare much more confidently rely on it, then *I* can press you to do on the former part (about the Transmutation or at least Destruction of Gold) till You or I shall have opportunity to repeat that Tryal.

Experiment VIII.

THough (*Pyrophilus*) the Experiment I am about to subjoyn may at the first glance seem onely to concern the *production of Tasts*, and be indeed one of the principal that I devis'd concerning that subject, and that belongs to the Notes I have made about those qualities: yet if you do not of your self take notice of it, I may hereafter have occasion to shew you, that there are some particulars in this Experiment, that are applicable to more then Tasts. And since I had once thoughts (however since discouraged by the difficulties of the Attempt) to make my

Notes

Notes extend even to *divers Qualities*, which the *operations of Chymiſts* and the *practice of Phyſicians* have made men take notice of; (ſuch as the powers of *corroding*, *precipitating*, *fixing*, *purging*, *bliſtering*, *ſtupifying*, &c.) I preſume You will not diſlike, that one who had thoughts to ſay ſomething even of Chymical and of Medical Qualities, if I may ſo call them, ſhould give you here an Experiment or two about more obvious though *particular* affections of Bodies, when there are ſeveral things in the Experiment that maybe of a *general import* to the Doctrine of the Origine of Qualities and Forms.

We took then an ounce of refined Silver, and having diſſolv'd it in *Aqua fortis*, we ſuffer'd it to ſhoot into Chryſtals, which being dried, we found to exceed the weight of the Silver by ſeveral Drachms, which accrued upon the concoagulation of the acid Salts that had diſſolv'd and were united to the Metal. Theſe Chryſtals we put into a Retort, and diſtill'd them in Sand, with almoſt as great a heat as we could give in a hammer'd Iron Furnace, wherein the operation was made; but there came over onely a very little ſowriſh Phlegm with an ill ſent, wherefore the ſame Retort being ſuffer'd to cool and then coated, it was remov'd to another Furnace, capable of giving a far higher degree of heat, namely, that of a naked fire, and in this Furnace the Diſtillation was purſued by the ſeveral

degrees of heat, till at length the Retort came to be red hot, and kept ſo for a good while; but though even by this operation there was very little driven over, yet That ſufficiently manifeſted what we aimed at, ſhewing (namely) that a Body extremely bitter might afford, as well as it conſiſted of, good ſtore of parts that are not at all bitter, but (which is a very differing taſt) eminently ſowr. For our Receiver being taken off even when it was cold, the contain'd ſpirit ſmoak'd out like rectify'd *Aqua fortis*, and not onely ſmelt and taſted like *Aqua fortis*, to the annoyance of the noſe and tongue, but being pour'd upon filings of crude Copper, it fell immediately to corrode them with violence, making much hiſſing, and ſending up thick fumes, and in a trice produc'd with the corroded Copper a blewiſh colour, like That which that Metal is wont to give in good *Aqua fortis*.

Afterwards we took *Minium* and *Aqua fortis*, and made a Solution, which being filtred and evaporated left us a *Saccharum Saturni* much like the common, made with ſpirit of Vinegar, then taking this ſweet Vitriol of Lead, (as we elſewhere call it) we endeavour'd in the formerly mention'd Sand-furnace to drive it over in a Retort; but finding that degree of fire incompetent to force over any thing ſave a little phlegmatick Liquor, we cauſ'd the Retort to be coated and transferr'd to the other Furnace, where being urg'd with a naked fire, it afforded

at

at length a ſpirit ſomewhat more copious then the Silver had done. This Spirit ſmoak'd in the cold Receiver as the other had, and did, like it, rankly ſmell of *Aqua fortis*, and was ſo farre from retaining any of the ſweetneſſe of the Concrete that had yielded it, that it was offenſively acid, and being pour'd upon *Minium*, it did with noiſe and bubbles fall upon it, and quickly afforded us a Liquor, which being filtred, did, by its Sweetneſſe as well as other proofs, aſſure us, that there would have needed but a gentle Evaporation (if We had leiſure to make it) to obtain from it a true Sugar of Lead; and 'tis remarkable, that the Concrete, which appear'd White before Diſtillation, remain'd, for the moſt part, behind in the Retort in the form of a black *Caput mortuum*, (ſometimes We have had it in a Yellowiſh Lump) which was neither at all ſweet, as the Vitriol of Lead it ſelf had eminently been, nor at all ſowr, as the Liquor diſtill'd from it was in a high degree, but ſeem'd rather inſipid, and was indeed but a *Calx* of Lead, which the heat of the fire had in part reduc'd into true and manifeſt Lead in the Retort it ſelfe, as appear'd by many Grains of ſeveral Sizes, that We met with in the *Caput mortuum*; (the reſt of which is eaſily enough reducible by fuſion with a convenient flux into malleable Lead it ſelf.)

There are ſome *Phænomena* of this Experiment, that we may elſewhere have Occaſion

to

to take notice of, as particularly that notwithstanding Silver be a Body so fix'd in the fire, that it will (as tis generally known) endure the Cuppel it self, and though in the dry'd Chrystals of Silver, the Salt, that adheres to the Silver, increases the weight of the Metal but about a fourth or a third part; yet this small proportion of saline Corpuscles was able to carry up so much of that almost fixedst of Bodies, that more then once we have had the inside of the Retort, to a great height, so cover'd over with the Metalline Corpuscles, that the Glasse seem'd to be Silver'd over, and could hardly, by long scraping, be freed from the copious and closely adhering Sublimate.

But the *Phænomenon*, that I chiefly desire to take notice of at present, is this, That not onely *Aqua fortis* being concoagulated with differing Bodies may produce very differing Concretes, but the same numerical Saline Corpuscles, that, being associated with those of one Metal, had already produc'd a Body eminent in one Taste, may afterwards, being freed from that Body, compose a Liquor eminent for a very differing Taste; and after that too, being combin'd with the particles of another Metal, would with them constitute a Body of a very eminent Tast, as opposite as any one can be to both the other Tasts; and yet these Saline Corpuscles, if instead of this second Metal, they should be associated with such a one as that, they are driven from,

would

would therewith exhibit agen the firſt of the three mention'd Taſts. To prove all this, We took Chryſtals of refined Silver made with *Aqua fortis*, and though theſe Chryſtals be, as we often note, ſuperlatively bitter; yet having, by a naked fire, extorted from them what Spirit we could, and found that, as we expected, extremely Acid, we put one part of it upon a few Filings of Silver, of which it readily made a Solution more bitter then Gall, and the other part of the diſtill'd Liquor We poured upon *Minium*: and though whilſt it had been an Ingredient of the Chryſtals of Silver committed to Diſtillation, it did with that Metal compoſe an exceſſively bitter ſubſtance, yet the ſame Particles being looſned from that Metal, and aſſociated with thoſe of the Lead did with them conſtitute a Solution, which by Evaporation afforded us a *Saccharum Saturni*, or a Vitriol ſweet as Sugar. And for further confirmation, we varied the Experiment, having in a naked Fire diſtilled ſome dry'd *Saccharum Saturni* made with *Aqua fortis*, the little Liquor that came over, in proportion to the Body, that afforded it, was ſo ſtrong a ſpirit of Nitre, that for ſeveral hours the Receiver was fill'd with the red Fumes; and though the ſmoaking Liquor were hugely ſharp, yet part of it, being pour'd upon a piece of its own *Caput mortuum*, (in which we perceiv'd not any Taſte) did at length (for it wrought but very ſlowly) exhibit ſome little Grains of a Saccharine Vitriol,

but

but the other part, being put upon Filings of Silver, fell upon it immediately with noiſe and ſtore of ſmoak, and a while after concoagulated with part of it (which it had diſſolv'd) into a Salt exceſſively bitter.

Experiment IX.

THe Artificial Tranſmutation of Bodies being as the rareſt and difficulteſt Production ſo one of the nobleſt and uſefulleſt Effects of Humane skill and power, not onely the cleare Inſtances of it are to be diligently ſought for and priz'd, but even the Probabilities of effecting ſuch an extraordinary change of Bodies are not to be neglected, eſpecially if the Verſion hop'd for be to be made betwixt Bodies of Primordial Textures, (if I may ſo call them) and ſuch Bodies, as by the greatneſſe of their Bulk and by their being to be found in moſt of the mix'd Bodies here below make a conſiderable part of thoſe, that we Men have the moſt immediately to do with. Invited by theſe conſiderations, *Pyrophilus*, I ſhall venture to give you the *Account* of ſome Obſervations and Tryals about the Tranſmuting of Water into Earth, though it be not ſo perfect as I Wiſh, and as I Hope by Gods bleſſing to make it:

The firſt Occaſion, afforded me to do any thing about this matter, was my being conſulted by a Gentleman, (an antient Chymiſt, but not at all a Philoſopher) who relating to me how much

much he had (with the wonted ſucceſſe of ſuch Attempts) labour'd after the Grand *Arcana*, complain'd to me among other things, that, having Occaſion to imploy great quantity of puri-fi'd Rain-water, he obtain'd from it much *leſſe* then he wiſh'd of the ſubſtance that he look'd for, but a *great deal* of a certain whitiſh excrementitious Matter, which he knew not what to make of. This gave me the curioſity firſt to deſire a ſight of it, in caſe he had not thrown it away, (which by good fortune he had not) and then, taking notice of the unexpected plenty and ſome of the Qualities of it, to ask him ſome Queſtions which were requiſite and ſufficient to perſwade me, that this Reſidence came not from accidental foulneſs of the Water, nor of the Veſſels twas receiv'd in. This I afterwards often thought of, and indeed it might juſtly enough awaken ſome ſuſpicions, that the little Motes, that have been ſometimes obſerv'd to appear numerous enough in pure Rain water whilſt it is diſtilling, might not be meerly accidental, but really produc'd, as well as exhibited by the action of the Fire. I thought it then worth while to proſecute this matter a little farther; and having put a pretty quantity of diſtill'd Rain-water in a cleane Glaſſe Body, and fitted it with a Head and a Receiver, I ſuffer'd it to ſtand in a Digeſtive Furnace, till by the gentle heat thereof, the Water was totally abſtracted, and the Veſſel left dry: which being taken out of the Sand, I found the

bottom

bottom of the Glaſſe all cover'd over with a white (but not ſo very white) ſubſtance; which being ſcrap'd off with a Knife appear'd to be a fine Earth, in which I perceiv'd no manifeſt Taſt, and which, in a word, by ſeveral Qualities ſeem'd to be Earth.

This incourag'd me to rediſtill the Rain-water in the ſame Glaſſe Body, whoſe Bottom, when the Water was all drawn off, afforded me more of the like Earth: but though the Repetition of the Experiment, and my having, for greater caution, try'd it all the while in a new Glaſſe, that had not been imploy'd before to other uſes, confirm'd me much in my conjecture, that unleſſe it could be prov'd, which I think will ſcarce be pretended, that ſo inſipid a Liquor as Rain-water ſhould, in ſo gentle a heat, diſſolve the moſt cloſe and almoſt Indeſtructible Body of Glaſſe it ſelf, (which ſuch corroſive Menſtruums as *Aqua fortis* and *Aqua Regis* are wont to leave unharm'd) the Earthy powder, I obtain'd from already diſtill'd Rain water, might be a Tranſmutation of ſome parts of the Water into that ſubſtance, yet having unhappily loſt part of my Powder, and conſum'd almoſt all the reſt, (for I kept a little by me, which you may yet ſee) I ſhould, till I had more frequently reiterated my Experiments, (which then I had not Opportunity to do, though I had thoughts of doing it alſo with Snow-water, that I had put into Chymical Glaſſes for that purpoſe, and with

with liquor of melted Hail, which I had likewiſe provided) and thereby alſo obtain'd ſome more of this Virgin Earth (as divers Chymiſts would call it) to make farther Tryals with, have retain'd greater ſuſpicions, if I had not afterward accidentally fallen into diſcourſe of this matter with a learned Phyſician, who had dealt much in Rain-water, but he much confirmed me in my conjecture, by aſſuring me, that he had frequently found ſuch a White Earth, as I mention'd, in diſtill'd Rain Water, after he had diſtill'd the ſame Numerical Liquor (carefully gather'd at firſt) I know not how many times one after another, adding, that he did not find (any more then I had done) any cauſe to ſuſpect, that if he had continu'd to rediſtill the ſame portion of Water, it would have yielded him more Earth.

But the Odneſſe of the Experiment ſtill keeping me in ſuſpence, it was not without much delight, that afterwards mentioning it to a very Ingenious Perſon, whom, without his leave, I think not fit to name, well verſ'd in Chymical matters, and whom I ſuſpected to have, in order to ſome Medicines, long wrought upon Rain water, he readily gave me ſuch an Account of his proceedings, as ſeem'd to leave little ſcruple about the Tranſmutation we have been mentioning: for he ſolemnly affirm'd to me, that having obſerv'd, as I had done, that Rain-water would, even after a Diſtillation or two, afford a Terreſtrial ſubſtance, which may ſometimes be

ſeen

ſeen ſwimming up and down in the limpid Liquor, he had the Curioſity, being ſetled and at leiſure, to try how long he could obtain this ſubſtance from the Water. And accordingly having freed Rain-water, carefully collected from its accidental and as it were feculent Earthineſſe, which it will depoſite at the firſt ſlow Diſtillation, (and which is oftentimes colour'd, whereby it may be diſtinguiſh'd from the White Earth made by Tranſmutation) he rediſtill'd it in very clean Glaſſes, not onely eight or ten times, but neer two hundred, without finding that his Liquor grew weary of affording him the White Earth, but rather that the Corpuſcles of it did appeare farre more numerous, or at leaſt more conſpicuous in the latter Diſtillation, then in the former. And when I expreſſed my Curioſity to ſee this Earth, he readily ſhew'd me a pretty quantity of it, and preſented me with ſome, which comparing with what I had remaining of mine, I found to be exceeding like it, ſave that it was more purely White, as having been for the maine afforded by Rain Water, that had been more frequently rectify'd. And to compare this welcome Powder with that I made my ſelfe, I try'd with this divers things, which I had before try'd with my own, and (becauſe the quantity preſented me was leſſe inconſiderable) ſome others too: For I obſerv'd in this new Powder, as I had done with my own, that being put into an excellent Microſcope

and

and plac'd where the Sun beams might fall upon it, it appear'd a white Meal or a heap of Corpuſcles ſo exceeding, not to ſay unimaginably ſmall, that in two or three choice Microſcopes both I and others had occaſion to admire it; and their extreme Littleneſſe was much more ſenſibly diſcern'd by mingling ſome few grains of Sand amongſt them, which made a mixture that look'd like that of pibble ſtones and of the fineſt flower. For our Earth even in the Microſcope appear'd to conſiſt of as ſmall particles, as the fineſt Hair-powder to the naked Eye. Nor could we diſcern this Duſt to be tranſparent, though, when the Sun ſhin'd upon it, it appear'd in the Microſcope to have ſome particles a little gliſtering, which yet appearing but in a glaring light, we were not ſure to be no *deceptio viſûs*.

2. I found, that our white powder being caſt in to water would indeed for a while diſcolour it by ſomewhat whitening it, which is no more then Spaud will do, and the fine duſt of white Marble and other ſtones, whoſe Corpuſcles by reaſon of their Minuteneſſe ſwim eaſily for a while in the water, but when it was once ſetled at the bottom, it continu'd there undiſſolv'd (for ought I could perceive) for ſome dayes and nights, as Earth would have done.

3. Having weigh'd a quantity of it, & put it into a new clean Crucible, with another inverted over it for a Cover, I plac'd it among quick coals, &

there kept the Crucible red hot for a pretty while, causing the Fire afterward to be acuated with a blast of a Bellows, but taking out the Powder, I neither found it melted nor clotted into lumps, nor, when I weigh'd it again, did I see cause to conclude that there was much of it wasted, besides what stuck to the sides of the Crucible and to a little Clay, wherewith I had luted on the Cover, (and which (to shew you that the Heat had not been inconsiderable) was in several places burnt red by the vehemence of fire;) and when I afterwards kept this Powder in an open Crucible among glowing coals, neither I nor one that I imployed to assist me perceiv'd it at all to smoak; and having put a little upon a quick coal, and blown That too, I found that which I had not blown away to remain fix'd (which some Bodies will not do) upon quick coals, that will endure the fire in a red hot Crucible.

4. I found this powder to be much heavier *in specie* then Water; for imploying a nice pair of Gold Scales, and a method that would be too long here to describe, I found that this Powder weigh'd somewhat (though not much) more then twice so much common Water, as was equal to it in Bulk. And least some Corollaries, that seem obviously contain'd in the common but groundless conceipts of the Peripateticks, about the proportions of the Elements in Density *&c.* should make you expect, that this powder ought to have been much more ponderous,

rous, I ſhall adde, that having had the curioſity, which I wonder no body ſhould have before me, to examine the gravity of the Earth, which ſeems the moſt Elementary of any we have, I took ſome ſifted Wood-aſhes, which I had cauſ'd to be three or four times boyl'd in a plentiful proportion of Water, to free them from Salt, and having put them very dry into common Water, I found them but little heavier then our newly mention'd Powder, ſurpaſſing in weight Water of the ſame Bulk but twice, and a little more then a 6th part; (Water and It being very little more then as 1 to $2\frac{1}{6}$.) And that you may the leſſe doubt of this, I will yet ſubjoyne, that examining the Specifick Gravity of (white) Glaſſe it ſelfe I found that compact Body to be very little if at all more then two times and an half as heavie as Water of equall bigneſſe to it. So that the Gravity of that Powder, which, borrowing a Chymical term, we have been calling Virgin-Earth, being added to its Fixtneſſe and other Qualities, it may ſeem no great impropriety of Speech to name it Earth, at leaſt if by Earth we mean not the pure Elementary Earth of the Schools, which many of themſelves confeſſe not to be found actually ſeparate, but a Body dry, cold, ponderous, induring the fire, and, which is the main, irreſoluble by Water and Fire into other Bodies ſpecifically different.

[But to return to the guiſe of the Powder, when I ask'd this Learned man whether he obſerv'd

ſerv'd the Glaſſe he diſtill'd in to have been fretted by the Liquor, and whether this loſt of its Subſtance, according as it depoſited more Powder, He anſwer'd me, (and he is a Perſon of unſuſpected Credit) that he found not his Glaſſe to have been injur'd by the Liquor, and that the Water waſted (though he were carefull it ſhould not do ſo by Evaporation and Transfuſions) by degrees ſo much, that there remain'd by his eſtimate but about an eighth part of the firſt quantity: and though for certain reaſons he kept by him the Liquor laſt diſtill'd, yet he doubted not, but that it might be very nigh totally brought into Earth, ſince out of an Ounce of diſtill'd Rain-water he had already obtain'd near three quarters of an Ounce, if not more, of the often mention'd Earth.]

Theſe ſeverall Relations will, I ſuppoſe, perſwade You, *Pyrophilus*, that this Experiment is hopefull enough to be well worth your purſuing, if not that perhaps none but ſuch a ſcrupulous Perſon as I, would think the proſecution of it other then ſuperfluous. And if You do acquieſce in what hath been already done, you will, I preſume, think it no mean confirmation of the Corpuſcularian Principles and *Hypotheſes*. For if, contrary to the Opinion that is ſo much in requeſt among the generality of modern Phyſitians and other Learned Men, that the Elements themſelves are tranſmuted into one another, and thoſe ſimple and Primitive Bodies,

dies, which Nature is presum'd to have intended to be the stable and permanent ingredients of the Bodies she compounds here below, may be artificially destroy'd, and (without the intervention of a Seminal and Plastick power) generated or produc'd: if, I say, this may be done, and that by such slight means, why may we not think that the changes and Metamorphoses that happen in other bodies, which are acknowledg'd by the Moderns to be far more lyable to alterations, may proceed from the Local motion of the minute or insensible parts of Matter, and the changes of Texture that may be consequent thereunto? Some bold Atomists would here be determining, by what particular wayes this strange Transmutation of Water into Earth may be perform'd, and would perchance particularly tell you, how the continually but slowly agitated parts of the Water, by their innumerable occursions, may by degrees rub and as it were grind themselves into such surfaces, as *either* to stick very close to one another by immediate contact, (as I elsewhere observe polish'd pieces of Glasse to do) *or* implicate and intangle themselves together so, as to make as it were little *knots*; which knots (he would add,) or the newly mention'd *clusters* of coherent particles, being then grown too great and heavy to be supported by the water, must subside to the bottom in the form of a

Powder, which by reaſon of the ſame gravity of the *Moleculæ* and the ſtrict union of the leſſer particles that compoſe them obtain an *indiſpoſition to diſſolve in water*, and to be *elevated or diſſipated by the fire*; as their *Inſipidneſſe* may be accounted for by its being but the ſame with that of the Liquor whence they were made, and their *Tranſparency* by that of the water they were made of, and by the multitude of the little ſurfaces that belong to ſo fine a powder. But though in favour of ſuch conjectures I could ſomewhat illuſtrate them, *partly* by applying to this occaſion what I elſewhere obſerve of the reducing of the fluid body of Quickſilver, by a bare Circulation (which is but a repeated Diſtillation) with a proportionable heat, into a real powder, which alſo will not ſo eaſily be raiſ'd by the fire, as the fluid Body, whence by change of Texture it was made; and *partly* by ſubjoyning among other things, how by the conjunction of two diſtill'd Liquors digeſted together I have obtain'd good ſtore of an inſipid ſubſtance that would not melt in water, and that would long enough endure no inconſiderable degree of fire; though, I ſay, by theſe and other ſuch particulars I could make our Atomiſts conjectures leſſe improbable, yet the full diſquiſition of ſo difficult a ſubject is too long and intricate to be proper for this place. *

* What is here delivered may be for the main verify'd by what the Reader will meet with in the (following) Xth. Experiment, though That be not It which the Author meant.

And therefore, without here examining our Atomists explication of this *Metamorphosis*, we will give him leave for a while to suppose the Transmutation it self to be real, and thereupon to consider whether the Historical part of it do not much disfavour some of the chief Doctrines of the Chymists and a fundamental one of *Helmonts*. For if the purest water may be turn'd into Earth, it will not be easie to make it improbable, that the other Ingredients of mixt Bodies, which the Chymists call their Hypostatical principles, are capable of being transmuted into one another, which would overthrow one of the main foundations of their whole Philosophy; and besides, if out of the simplest water it self a moderate fire can produce a large proportion of Earth, that was not formerly præexistent in it, how shall we be sure, that in all the *Analyses* which the fire makes of mixt bodies, the substances thereby exhibited are obtain'd by Separation onely, without any Transmutation? As for *Helmont* tis well enough known, that he makes Water to be the Material principle of all bodies here below, which he would have to be either water it self, or but water disguis'd by those Forms, which the Seeds of things have given it. I will not here examine whether this opinion, if he had restrain'd it to Animals and Vegetables, might not with some restriction and limitations be kept from appea-

ring abſurd, ſince my *Eleutherius* hath (though without abſolutely adopting it) elſewhere pleaded for its not being ſo extravagant, as it hath been thought.

But whereas *Helmont*'s grand argument from Experience is grounded on this, that the Alkaheſt doth, as he affirms, by being digeſted with and diſtill'd from other tangible Bodies, reduce them all at laſt into a Liqnor no way differing from Rain-water, though we ſhould grant the matter of fact, yet the Experiment of our Powder will warrant me to queſtion their Ratiocination. For if all mix'd Bodies be therefore concluded to be materially from water, becauſe they are by the operation of the fire and a Menſtruum, after having paſſ'd through divers previous changes, reduc'd at length into inſipid water; by the ſame way of arguing (and with greater cogency) I might conclude, that all thoſe Bodies are materially but diſguiſ'd Earth, ſince without intervention of a Seminal principle, (for *Helmont* will not allow that title to Fire, which he ſtiles the Artificial death of Things) Water it ſelf may be turn'd into Earth. Indeed if that acute Chymiſt were now alive, and had ſuch an immortal Liquor, as he deſcribes his *Alkaheſt* to be, I would gladly put him upon trying whether that Menſtruum would reduce our white Earth into Water. But there being no more probability of that, then

that

that ſuch reproduc'd water, being juſt what it was before, might be turn'd into Earth again; it may be probably ſaid, that ſince theſe Bodies are mutually convertible into one another, (and as to the verſion of water into Earth, by a ſeemingly ſlight operation) they are not either of them ingenerable and incorruptible Elements, much leſſe the ſole matter of all tangible bodies, but onely two of the primordial and of the moſt obvious Schematiſms of that which is indeed the univerſal matter, which as it comes to have its minute particles aſſociated after this or that manner, may, by a change of their texture and motion, conſtitute with the ſame Corpuſcles ſometimes Water and ſometimes Earth.

But (*Pyrophilus*) to leave theſe reflexions, to return to the bold conjectures that they are grounded on; though if I had leiſure and indulgence enough, I could, I confeſſe, add many things in favour of ſome of thoſe Thoughts:* yet I would not have you wonder, that whilſt I was mentioning the many particulars that ſeem to evince the change of water into Earth, I ſhould let fall ſome words that intimate a diffidence about it. For to diſguiſe nothing unto you, I muſt confeſſe, that having in ſpight of an unuſual care unluckily loſt a

* Of the poſſible wayes of turning Liquors into conſiſtent Bodies, by bending, breaking, twiſting, and by otherwiſe changing the Texture of the Liquor, ſee more particularly the *Hiſtory of Fluidity and Firmneſſe*, publiſh'd by the Author.

whole

whole paper of the Powder I had made my ſelf, and having unexpectedly been oblig'd to remove from my Furnaces, before I had made half the tryals I judg'd requiſite in ſo nice a caſe, I have not yet laid aſide all my ſcruples.

For 1. I would gladly know, whether the untranſmuted Rain water, by the depoſition of ſo much Terreſtrial Matter, were grown lighter *in ſpecie* then before, or ſharp in taſt: Next I would be throughly ſatisfied, (which I confeſs I am not yet, notwithſtanding all that the followers of *Angelus Sala* have confidently enough written) whether and how far inſipid Liquors (as Rain water is) may or may not work as Menſtruums upon ſtones or Earthy bodies: not to queſtion whether the particles of Rain-water may not by their mutual attrition or ſome other action upon one another be reduc'd into ſhapes and ſizes fit to compoſe ſuch a menſtruum as the Liquor was not before; as in diverſe plants, that ſeem'd to be nouriſh'd onely with water, the Sap is endow'd with a ſharp taſt and great penetrancy and activity of parts.

2. It were alſo fit to know whether the glaſs Body, wherein all the Diſtillations are made, do looſe of its weight any thing neer ſo much as the obtained powder amounts to over and above the decrement of weight, which may be imputed to the action of the heat upon the ſubſtance of the Glaſſe, in caſe it appear by another Glaſſe, kept empty in an equal heat, and for the

ſame

ſame time, that the Glaſſe looſes by ſuch Operations any thing worth reckoning. And it were alſo not impertinent to try, whether the Gravity of the obtain'd Powder be the ſame *in ſpecie* with that of the Glaſſe, wherein the Diſtillations were made: (for that it *differ'd but about a fifth part* from the weight of Chryſtalline Glaſſe I lately mention'd.) Which ſcruple and ſome of the former I might have prevented, if I had had convenient Metalline Veſſels, wherein to make the Diſtillations inſtead of Glaſſe ones.

3. I could wiſh likewiſe that it were more demonſtrably determin'd, what is on all hands taken for granted, (as it appears indeed highly probable) that diſtill'd Rain Water is a perfectly Homogeneous Body, which if it be not, divers ſuſpicions might be ſuggeſted about its Tranſmutation into Earth, and if it be, 'twill be as a very ſtrange thing, ſo a matter of very great difficulty to conceive, how a perfectly and exquiſitely Homogeneous Matter ſhould, without any Addition or any Seminal and Plaſtick Principle, be brought to afford great ſtore of a Matter of much more Specifick Gravity then it ſelf, ſince we ſee, that no Aggregate we can make of Bodies but equiponderant *in ſpecie* with water doth by vertue of their Convention grow ſpecifically heavier then it.

4. Having had the Curioſity to try, whether Corroſive Liquors would work upon our white Powder,

Powder, I found, that not onely good Oyl of Vitriol would corrode it, but ſtrong and deflegm'd Spirit of Salt did readily work upon part of it, and that without the aſſiſtance of heat, though not without hiſſing and exciting great ſtore of bubbles, as I have known ſuch Menſtruums do, when put upon *Lapis Stellaris* or *Oßifragus* or ſome ſuch ſoft Stone; as if that ſo much defecated Rain-Water, actuated by heat, had reſolv'd ſome of the looſer Corpuſcles of the Sand or Stone, that together with ſome Salts compoſe common Glaſſe, as I have obſerv'd in ſome Petrifying Water, that ſome of the Bodies I took up, and which were preſum'd to be petrify'd, were but cruſted over with Stone, that ſeem'd generated but by the ſucceſſive appoſition of Stony Particles, that lying inviſibly mingled with the running Water ſtuck in their paſſage to the conveniently diſpos'd Bodies that lay in the Streams way. But yet I muſt not omit, that when I ſuffer'd this Mixture to ſettle, as much of the Powder, as ſeem'd to be a very great part of it, remain'd in the lower part of the Liquor, as if that had rather fretted then diſſolv'd it, and that not becauſe the Menſtruum was overcharg'd or glutted, as I found by putting in afterwards ſeveral freſh parcels of Powder, which it readily fell upon, not without noiſe and froth. Nor muſt I forget, that ſometimes I have excited ſuch an Ebullition, by powring the ſame Liquors upon the Earthy

part

part of Wood-ashes, several times wash'd in boyling water; (though, I confesse, I afterwards somewhat suspected there might remain some little adhering *Alkaly*, which might occasion those Bubbles, notwithstanding that both I and another, whom I also invited to taste it, took the Earth to be quite Saltlesse.) I might (*Pyrophilus*) adde, that sometimes also me thought I found this Powder (which yet likewise sometimes hapned to me with the lately mention'd Earth of Wood-ashes) somewhat gritty between my Teeth, and subjoin divers other particulars, if it were not too tedious to mention to You all the doubts and considerations that have occurr'd to me about the recited Change of Water into Earth: which yet are not such as ought to hinder me from giving You the Historical account I have set down, since to some of my Scruples I could here give plausible Answers, but that I cannot do it in few words. And if any part of our white Powder prove to be true Earth, no body perhaps yet knowes to what the Experiment may lead sagacious Men: and whether in a strict sense it be true Earth or no, yet the *Phænomena*, that are exhibited in the production of it, are sufficient to give this ninth Experiment a place among the others (of the same Decad) with which 'tis associated. For since out of a substance that is universally acknowledg'd to be Elementary and Homogeneous, and which manifestly is fluid, transparent,

transparent, much lighter *in ſpecie* then Earth, moiſt and fugitive, there is artificially generated or obtain'd a Subſtance conſiſtent, white, and conſequently opacous, comparatively ponderous, dry, and not at all fugitive; the Alteration is ſo great and effected in ſo ſimple a way, that it cannot but afford us a conſiderable Inſtance of what the varied Texture of the minute parts may perform in a Matter confeſſedly ſimilar. And if frequently diſtill'd Rain Water ſhould not be allow'd Homogeneous, our Experiment will at leaſt ſhew us, better then perhaps any hath yet done, how little we are bound to believe what the Chymiſts and others tell us, when they pretend manifeſtly to exhibit to us Homogeneous Principles, and Elementary Bodies, and how difficult it is to be certain when a Body is abſolutely irreſoluble into ſpecifically differing ſubſtances, and conſequently what is the determinate number of the perfectly ſimple Ingredients of Bodies: (ſuppoſing that ſuch there are.) Though I muſt confeſſe, that my onely aime is not to Relate what hath been done, but to Procure the proſecution of it. For if the obtain'd Subſtance be, by the Rain Water, diſſolv'd out of the Glaſſe, this will both prove a noble and ſurprizing Inſtance of what may be done by inſipid Menſtruums, even upon Bodies that are juſtly reckoned among the compacteſt and moſt indiſſoluble that we know of, and may afford us many other

other conſiderable hints, that have been partly intimated already: and if on the other ſide, this Powder, whether it be true Elementary Earth or not, be found to be really produc'd out of the Water it ſelf, it may prove a *Magnale* in Nature, and of greater conſequence then will be preſently foreſeen, and may make the Alchymiſts hopes of turning other Metals into Gold appear leſſe wild, ſince that by Experimentally evincing, that two ſuch difficult Qualities to be introduc'd into a Body, as conſiderable degrees of Fixity and Weight, (whoſe requiſiteneſſe to the making of Gold are two of the Principal things, that have kept me from eaſily expecting to find the Attempts of Alchymiſts ſucceſſeful) may, without the mixture of a Homogeneous Matter be generated in it, by varying the Texture of its parts.

I will not now adventure to adde any thing of what I have been attempting about the tranſmuting (without additaments) of pure Alkalizate Salts into Earth, becauſe I do not yet know, whether the Tryals will anſwer my Hopes: (for I do not yet call them my Expectations.) But upon this ſubject of Tranſmutations, I could, if it did not properly belong to another Treatiſe, tell you ſomething about the changes, that may be wrought upon highly rectify'd Spirit of Wine, which would perchance make You think of other things of the like kind leſſe infeaſible. For whereas 'tis a known thing, that

that that ſpirituous Liquor being kindled, (and that, if you pleaſe, by other Spirit of Wine actually fir'd) will, for ought appears, burn all away, that is, be totally turn'd into flame; if I durſt rely in ſo important a caſe on a couple of Tryals, whilſt I hope for an Opportunity of making farther ones, I would tell You, that by a way unthought on (that I know of) by any Body, I have without any addition obtain'd from ſuch Spirit of Wine, as being kindled in a Spoon would flame all away, without leaving the leaſt drop behind it, a conſiderable quantity of downright incombuſtible Flegm. And by another way (mention'd indeed by *Helmont*, but not taught to almoſt any of his Readers) ſome Ingenious Perſons, that you know and eſteem, working by my directions, (but without knowing what each other was doing) did both of them reduce conſiderable quantities of high rectify'd Spirit of Wine (that would before have burnt all away) into a Liquor, that was for the moſt part flegm, as I was inform'd as well by my own taſte, as by the Tryals I order'd to be made: (being forc'd my ſelf to be moſt commonly abſent.) From which change of the greateſt part of that at firſt liquid Spirit into Flegm, it ſeems deducible, that the ſame portion of Matter, which by being kindled, may be turn'd all into Fire, may be, by another way of handling, turn'd into Flegm or Water, and this without the addition of any thing, and without being wrought upon

by

by any visible body, but one so extremely dry as duely prepar'd salt of Tartar; and that it self is not so indispensably necessary to the obtaining of phlegm out of totally inflammable spirit of Wine, but that, as I was saying, I did by another way obtain that dull liquor without imploying the Salt or any other visible body whatsoever. But I make a scruple to entertain you any longer with extravagancies of this nature, and yet if I were sure you would contain your smiles, I would adde for conclusion, that if I had had time and opportunity to furnish my self with any quantity of that water, I had it in my thoughts to try whether that would have afforded me such a terrestrial substance as Rain-water had done, and thereby have undergone a new and further *Metamorphosis*.

The X. Experiment.

THere is one Experiment more, two of the chief *Phænomena* of which belong to another Discourse, (where I particularly mention them) and yet I shall conclude this little Treatise with the recitation of the Experiment it self, not onely becaus divers of the *Phænomena* do eminently belong to our present subject, but because I have scarce met with any Experiments more suitable to the design I have of shewing, before I conclude this Discourse, what great and sudden productions and destructions of

Qualities may be effected by the compoſition of the ſmalleſt number of ingredients even among liquors themſelves, and ſuch too as are believ'd to be both of them ſimple and homogeneous and incapable of putrefaction, that ſo it may appear what notable alterations of Qualities even ſeemingly ſlight and eaſie mixtures can perform among bodies, both of them fluid, as well as among thoſe that were either both of them ſtable, or one of them ſtable and the other conſiſtent.

Take then of good oyl of Vitriol and of ſpirit of Wine, that will burn all away, equall parts, not in quantity but in weight; put them together by little and little, and having plac'd the mixture in a Bolt-head or Glaſs-egg with a long neck, and carefully ſtop'd it with a Cork and hard wax, ſet the veſſel in a moderate heat to digeſt for a competent while, (two or three weeks may do well) then pour out the mixture into a tall Glaſs Cucurbite, to which lute on a Head and a Receiver with extraordinary care, to prevent the avolation of the ſpirits, which will be very ſubtle: then with a very gentle fire abſtract the ſpirit of Wine, that will firſt aſcend, and when the drops begin to come over ſowiſh, ſhift the Receiver, and continue the Diſtillation with great care that the matter boyl not over, and when you judge that about half the acid liquor is come over, it will not be amiſs, though it be not neceſſary, to change the Receiver once more; but whether

ther you do this or no, your Diſtillation muſt be continued, increaſing the fire towards th latter end, till you have brought over all you can, and what remains in the bottom of the Cucurbite muſt be put into a Glaſſe well ſtopp'd to keep it from the air.

NB. 1. That to the production of moſt if not of all the *Phænomena* of this Experiment, it is not abſolutely neceſſary that ſo long a Digeſtion (not to ſay, not any) be premiſ'd; though if the time above preſcrib'd be allow'd, the Experiment will ſucceed the better.

2. That, I remember, I have ſometimes made uſe of oyl of Sulphur *per Campanam* (as they call it) in ſtead of oyl of Vitriol, to produce the recited *Phænomena*; and though the attempt ſucceeded not ill as to divers particulars, yet I afterwards choſe rather to employ oyl of Vitriol; both becauſe it did in ſome points better anſwer my expectation then the other liquor, and becauſe I would not give occaſion to ſuſpect, that the Odours, hereafter to be mention'd as *Phænomena* of our Experiment, were due to the common Sulphur, whence the unctuous liquor made *per Campanam* was obtain'd, as ſuch, and did no way proceed from the acid Vitriolate ſalt, which that oyl (as tis improperly call'd) doth abound with.

3. That I had likewiſe the curioſity to digeſt oyl of Vitriol with Spaniſh wine in ſtead of ſpirit of Wine, by which means I obtain'd an odd ſpirit

and residence, and some other *Phænomena*, which I content my self to have in this place given hint of, in regard that Wine being a liquor of a much lesse simple nature then its spirit, the *Phænomena*, afforded me by this, are much fitter for my present purpose.

4. That great care must be had in regulating the fire, when once a good part of the acid spirit mention'd in the processe is come over. For if the Fire be not increas'd, the rest will scarce ascend, and if it be increas'd but a little too much, the matter will be more apt, then one would suspect, to swell exceedingly in the Cucurbite, and perhaps run over into the Receiver, and spoile what it finds there, as it hath more thence once hapned to me, when I was fain to commit the management of the fire to others.

Now the oyl of Vitriol and the spirit of Wine being both of them distill'd Liquors, and the latter of them several times redistill'd, and one of them being drawn from so simple and familiar a substance as Wine, and the other from a Concrete not more compounded then what Nature her self (which, as I elsewere shew, can without the help of Art produce Vitriol) doth divers times present us with; these Liquors, I say, being both of them distill'd, and consequently volatile, one would expect that by distilling them they should be brought over united, as I have tryed that the spirit of Wine and of Nitre or also of common Salt may be; and as the spirits of differing

ring Vegetables are wont to be; or that at leaſt the Diſtillation ſhould not much alter them from what it found them, after they had been well mingled together. But this notwithſtanding, theſe two Liquors being of very odd Textures in reference to each other, their conjunction and diſtillation will make them exhibit divers conſiderable and perhaps ſurprizing *Phænomena*.

For firſt, whereas ſpirit of Wine has no great ſent, nor no good one, and moderately deflegm'd oyl of Vitriol is wont to be inodorous; the ſpirit that firſt comes over from our mixture hath a ſent not onely very differing from ſpirit of Wine, but from all things elſe that I remember I ever ſmelt. And as this new odour doth to almoſt all thoſe, whoſe opinions I have asked about it, ſeem very fragrant and pleaſant, ſo I have ſometimes had it ſo exceeding ſubtle, that in ſpight of the care that was taken to lute the Glaſſes exactly together, it would perfume the neighbouring parts of the Laboratory, and would not afterwards be kept in by a cloſe cork, cover'd with two or three ſeveral bladders, but ſmell ſtrongly at ſome diſtance from the Viol wherein it was put. I did not think it unlikely, that ſo noble and piercing a Liquor might be of no mean efficacy in Phyſick, and though I miſs'd of receiving an account of its effects from ſome ingenious Phyſicians, into whoſe hands I put it to have tryals made of it, yet I cannot diſpair of finding it a conſiderable Medicine, when I re-

member, partly what hath been done by ſome acquaintances of mine with bare phlegm of Vitriol, upon the account (as is ſuppoſ'd) of that little Sulphur of Vitriol, that, though but ſparingly, doth enrich that Liquor; and partly, what the Maſters of Chymical *Arcana* tell us of the wonderful vertues of the Volatile Sulphur of Vitriol, and what I have obſerv'd my ſelf, that may invite me to have a good opinion of Remedies of that nature.

2. But to ſhew how much the Odours of bodies depend upon their Texture, I ſhall now adde, that after this volatile and odoriferous ſpirit is come over, and has been follow'd by an acid ſpirit, it will uſually towards the latter end of the Diſtillation be ſucceeded by a Liquor, that is not onely not fragrant, but ſtinks ſo ſtrongly of Brimſtone, that I have ſometimes known it almoſt take away the breath (as they ſpeak) of thoſe, who, when I had the Receiver newly taken off in my hand, did (either becauſe to make ſport I gave them no warning, or becauſe they would not take it, as thinking what I told them impoſſible) ſtoo boldly adventure their noſes in the tryal.

3. There is in this operation produc'd a Liquor, that will not mingle either with the fragrant or with the fetid ſpirit hitherto deſcrib'd, but is very differing from both of them, and is ſo very pleaſant, ſubtle, and Aromatical, that it is no leſſe differing as well from ſpirit of Wine

as

as oyl of Vitriol. But of this Liquor I give a further account in a more convenient place.

4. When the distillation is carried on far enough, you will find at the bottom, that the two above mention'd diaphanous spirits (for oyl of Vitriol is indeed rather a saline spirit then an oyl) have produc'd a pretty quantity of a substance, not onely very opacous, but black almost like Pitch or Jet.

5. And this substance, though produc'd by two Bodies that were not onely fluid but distill'd, will not alone be consistent, but (if the Distillation have been urg'd far enough) brittle.

6. And though spirit of Wine be reputed the most inflammable, and oyl of Vitriol the most corrosive liquor that is known, yet I could not find, that this black substance would easily if at all be brought, I say not to flame, but to burn; nor that it had any discernible tast, though both the Liquors from whose mixture it was obtain'd, have exceeding strong and pungent tasts.

7. And whereas both oyl of Vitriol and spirit of Wine will each of them more readily then most Liquors that are yet known, mingle with common water, and diffuse it self therein, I observ'd, that this pitchy mass, if the Distillation had been continued till it was perfectly dry, would not, that I could perceive, dissolve in common water for very many hours, and, if I much misremember not, for some dayes.

8. And lastly, whereas the oyl of Vitriol and the spirit of Wine were both of them distill'd Liquors, and one of them exceeding volatile and fugitive; yet the black mass produc'd by them was so far fix'd, that I could not make it rise by a considerably strong and lasting fire, that would have rais'd a much more sluggish body then the heaviest of those that concurr'd to produce it.

The remaining particulars that I have observ'd in this Experiment belong to another Treatise, and therefore I shall forbear to mention them in this: nor shall I at present adde any new *Phænomena* to those I have already recited; those freshly mention'd Experiments, and those that preceeded it being, even without the assistance of the four Observations I have delivered before them, sufficient to manifest the truth I have been endeavouring to make out. For in the Experiments we are speaking of, it cannot well be *pretended*, or at least not well *prov'd*, that any substantial Forms are the causes of the effects I have recited. For in most of the (above mention'd) cases, besides that in the bodies we imploy'd, the seminal virtues, if they had any before, may be suppos'd to have been destroy'd by the fire, they were such, as those I argue with would account to be *factitious* bodies, artificially produc'd by Chymical operations. And tis not more manifest, that in the production of these effects there intervenes a Local motion and change

change of Texture by these Operations, then 'tis inevident and precarious, that they are the Effects of such things, as the Schools fancy Substantial Forms to be: since 'tis in these new Experiments, by the Addition of some new particles of Matter, or the Recess or Expulsion of some præexistent ones, or, which is the most frequent way, by the Transpofition of Minute parts, yet without quite excluding the other two, that no more skilful a Chymist then I have been able to produce by Art a not inconsiderable number of such changes of Qualities, that more notable ones are not ordinarily presented us by Nature, where she is presumed to work by the help of Substantial Forms: I see not why it may not be thought probable, that the same Catholick and fertile Principles, *Motion*, *Bulk*, *Shape*, and *Texture* of the Minute parts of *Matter*, may, under the Guidance of Nature, (whose Laws the modern Peripateticks acknowledge to be establish'd by the all-wise God) suffice likewise to produce those other Qualities of Natural Bodies, of which we have not given particular Instances.

FREE CONSIDERATIONS ABOUT SUBORDINATE FORMES, As they are wont to be maintain'd by divers Learned Modernes.

THe generality of vulgar Philoſophers have for many ages ſo handled the doctrine of Formes as if they ſuſpected not that more then one forme could belong to a Natural Body: But ſome later writers, eſpecially the learned *Sennertus*, and, if you will believe *him*, the famous Peripatetick *Zabarel* himſelfe have endeavour'd to introduce an Hypotheſis, which teaches that in Animals and Plants, beſides the Specifick Form, as *Sennertus* calls it, which alone is wont to be taken notice of, there may reſide in thoſe Body's and eſpecially in ſome determinate parts of them, certain other Formes proper to thoſe parts, but nevertheleſſe ſo ſubjected to the predominant Miſtreſſe Forme, if I may ſo call it, that they deſerve the Title but of ſubordinate Forms, and during the reigne of the Specifick Form, are ſubſervient to it, but in the

the capacity (as it were) of matter; yet ſo that when the Specifick Forme comes to be aboliſh'd or depoſ'd, theſe ſubordinate Forms may come to ſet up for themſelves, and in reference to thoſe parts of matter they belong to, exerciſe the functions of Specifick Form's: as in a dog or a Horſe beſides the ſenſitive Soul which is the Specifick Forme of the whole Beaſt, the fleſh and Blood and Bones have their diſtinct Forms, which appertaine to them as they are ſuch Body's though they are ruld and imploy'd by the Soul, but as the matter which ſhe animates and informes, and when by death the ſenſitive Soul or Specifick Forme is depoſ'd or aboliſh'd the Body is not preſently reſolv'd into the foure Elements, much leſſe reduc'd into the firſt matter, but thoſe ſubordinate Forms doe ſtill keep the fleſh, fleſh; and the Bone, Bone; the one for a little, and the other for a much longer time.

To make out this doctrine, He ingeniouſly urges the Specifick Vertues obſervable in gather'd Plants, and particularly the purgative faculty of Rhubarb, Senna, and other Cathartick Vegetables. And though, as to this noble ſort of Examples afforded him by the ſpecifick property's they are endow'd with, when they are depriv'd of the life they injoy'd as Plants, it may not be pretended by the obſtinate, that, for ought has been yet try'd, Rhubarb, Senna, *&c.* are not purgative whilſt they are living Plants, and ſo when they are dead do not ſo much retain

taine as acquire that ſpecifick Vertue; as wine obtains divers medicable Vertues (as that of cooling, diſſolving Coral, Pearle, *&c.*) when (by ſome alteration imperceptible to ſight) looſing its predominant Forme it turnes to Vineger, which it had not before; yet 'twere not difficult to propoſe Experiments that would determine this Scruple if it were thought important enough. And I ſhall adde, that 'tis evident that Damask-roſes, for inſtance, which are purgative, retaine for a conſiderable time the ſame colour, and fragrant odour *&c.* when they are gather'd, and conſequently acknowledg'd to be depriv'd of life, as when they grew upon the Tree.

This doctrine of *Subordinate Formes* has bin ſo well entertain'd, and ſuppoſ'd to be of ſuch importance, and (which nearly concerns the paſt diſcourſe) to afford ſuch countenance to *Subſtantial Formes*, that the nature of our preſent diſcourſe forbids me to leave it altogether untouch'd, and the rather becauſe I have not found it ſo much as taken notice of by the Corpuſcularian Philoſophers. But as (on the one hand) this conſideration invites me to offer ſome thing about this matter, ſo, (on the other ſide) joyning with the difficulty and abſtruſeneſſe of the ſubject, it would deterre a bolder writer then I to pretend to give a full and ſatisfactory account of ſo perplext and abſtruſe a matter. And therefore I ſhall think my attempt may be excuſable (if not acceptable) if I can at preſent ſhow that

Subordinate

Subordinate Forms *may* be intelligibly explicated in a general way according to the Corpuſcularian Principles, or are at leaſt very reconcileable thereunto. And in regard that, as I juſt now intimated, the Patrons of theſe ſubjugated Forms aſſert ſubſtantial ones, and proceed upon other Notions that we do not admit, I muſt venture to explicate this matter in a way very differing from theirs. And it will not be amiſſe to begin my diſcourſe with laying downe ſome obſervations which may ſerve *partly* to adde ſome things unmention'd to thoſe that are mention'd by *Severtus*, or *Zabarel* towards clearing up the Notion and Nature of Subordinate Forms (a ſubject not obvious, nor eaſy to be made plaine) and *partly* to make way for the carrying on the ſubſequent part of the diſcourſe without thoſe excurſions that would elſe too much interrupt it.

Firſt then we may conſider that, according to what I have formerly diſcourſ'd, the name *Form* is a Technical word or terme of Art, whoſe ſignification, as I there alſo noted, is not ſo well defin'd as is preſum'd, and were to be wiſh'd. But without much injury to the more obvious and uſual Notion of it, we may obſerve that 'tis commonly ſome *one* conſiderable thing, (or at moſt, ſome *few* things) ſuch, for the moſt part, as *ſome conſpicuous Phænomenon that is exhibited*, or *ſome peculiar Operation* that is *perform'd* by it, or *ſome particular uſe*, to which it is applicable, upon

upon whose account this or that Form is attributed to this or that natural Body, and only upon the receſſe or abolition of which it is ſaid to looſe its *Forme*, or if you pleaſe, *Denomination*.

Secondly I conſider that the Bodie whoſe being or not being endow'd with ſubordinate Forms is contended for, are generally either Vegetables, or Animals, or Bodies belonging to them, and conſequently theſe Bodies being of a very compounded Nature conſiſt of parts whether Organical or not, that are not all of them of the ſame Nature, which I take to be true, not onely of thoſe parts that are unanimouſly taken to be Organical, but of many of thoſe that are reputed Similar, becauſe as to ſence they are ſo. This is evident in Bones, which though believ'd to have as good a right as any to the Title of Similar parts, do yet by diſtillation afford Salt, Oyle, Flegme, Spirit, and Aſhes. And Vitriol, though Similar as to ſenſe, may be (as we formerly noted,) Artificially produc'd by uniting the Metalline particles of Iron or Copper with the ſaline Corpuſcles of diſtill'd Salt or Nitre. Which inſtance I the leſſe ſcruple to make uſe of, becauſe that though the Patrons of Subordinate Forms ſeem to have aſſerted them to give ſome account of what happens in Vegetables and Animals, when the ultimate Form is aboliſht or expeld, yet for my own part I ſee not why we may not alſo attribute ſubordinate

Forms

Forms to divers Inanimate Bodyes. To illustrate this matter, I will borrow an Example from Rhubarb, (for this drugge as 'tis sould in the Shops is an inanimate Body) wherein the purgative faculty is affirm'd to proceed from a Substantial Form, which Virtue, whilst the Rhubarb grew in the ground, did, as they teach us, proceed from the Specifick Form. For if from the same Rhubarb we do by a convenient Menstruum extract together with the finer parts of the Body all the purgative Vertue, (which, as *Sennertus* himself teaches, may very well be done) I see not why according to his grounds, the *remaining Rhubarb*, which will retain divers of its former Qualities, if not discloſe some new ones, ought not to have a peculiar Form distinct from that which He and the Schools call *Forma mistionis* assigned to it, to which those qualities may be attributed, and which consequently may be look'd upon as a subordinate Form in reference to that which the Intire though Inanimate Rhubarb had before. But whatever become of this instance, there are other Body's wherein I see not why according to his grounds a Subordinate Form may not be allow'd. For in an Olive or an Almond (for example) though when it is gather'd it ceases to be animated by the vegetative soul of the Tree, yet it retains the same shape, colour, *&c.* that it had before it was gather'd, (which it retains upon the account of the subordinate Form that belong'd toit as such a fruit)

by

by vertue of which Form it may be preſerved ſound during a whole year, or perhaps much longer; ſo when by barely cruſhing the pulp of the Olive between your fingers you may immediately ſqueeze out Oyle, *which* confeſſedly was preexiſtent there (the preſſure onely aſſociating ſo many parts as to make them viſible) and which is a peculiar liquor endow'd with noble qualities, and capable of preſerving it ſelf divers years: I ſee not, (I ſay) why the Form of this Oyle, from whence its qualities muſt be ſayd to flow, may not be look'd upon as having been, whilſt the liquor made a part of the Olive, a ſubordinate Form to that of the intire fruit, whoſe remaining part having alſo its own peculiar qualities, and that ſuch, whereby, for inſtance, an Olive that has loſt its Oyle much differs from an Almond that has loſt it's alſo, may for ought I ſee deſerve to have a diſtinct ſubordinate Form aſcrib'd unto it. But to make this out the better, I ſhall here adde a couple of examples that perhaps will ſeem clear enough; The *one* is Sulphur Vive, wherein (to ſpeak according to Chymical Notions) Nature has united under one Form two Bodies of very differing kinds, the one readily inflammable, and the other a great reſiſter of Fire; and yet theſe two are eaſily ſeparable as may appear by the known Chymical practice of kindling Sulphur under a Glaſſe bell. For the oleaginous part (as the Combuſtible is ſuppos'd) manifeſtly burns away with a blew flame, and the Saline

Corpuſcles meeting with the moiſt vapours, that are commonly interſperſ'd in the Aire, are condenſ'd againſt the ſides of the Glaſſe into a higly ſharp & corroſive Menſtruum;) which may ſeveral wayes be brought to exhibit its ſalt in a dry and brittle Form.) The *other* inſtance I was to mention is alſo of a Body that cannot be pretended to be factitious, (namely *Cinnabaris foßilis*) for in this concrete under the Form of a Mineral ſtone, Nature has ranged three (if not more) compleat Bodies, that has each of them its own diſtinct Form, and that exceeding different from the others; as may appear when theſe Bodies are skilfully ſeparated. For thence, as we noted above, we have obtain'd a running Mercury, an inflammable Sulphur, which it ſelf will be eaſily allow'd to be a compounded Body and a ſtrange concrete whoſe properties I had not occaſion to look into. To theſe inſtances I might adde divers others if it were neceſſary ſo to doe. And if it be ſaid that theſe Form's are not ſubordinate, but rather coordinate, it will lye upon the objectors to prove it, who perhaps will find it no eaſy matter to evince that the ſame Ingredient, for inſtance, of Sulphur, is not as much ſubjugated by the Form of the intire Body, as that of the purgative portion of Rhubarb, by the Form of that Drugg. But if it did appear that theſe Forms were more properly ſtyl'd Coordinate then Subordinate, it would not much trouble me, who am inclin'd to think that divers of the

Forms

Forms which *Sennertus*, and his followers call ſubordinate or ſubjugated, may be as fitly ſtyl'd Coordinate or *concurrent*, ſince I ſhall ſhow anon, that I do not aſcribe to the ſpecifick, or ſupream Form in reference to the reſt, ſuch a Coërcive power and Dominion, as thoſe learned Men are pleas'd to doe.

Thirdly I conſider that all theſe differing Bodies whereof, as of parts, or as of Ingredients, a compounded Body is made up, are by vertue of the Compoſition and peculiar Fabrick thereof ſo put together or contriv'd, that they concurre to thoſe Actions or Operations which are proper to the Body as ſuch, and therefore are preſum'd to flow immediatly from the Form of it. For an inſtance of which I ſhall name Gunpowder, where three Ingredients upon a very ſlight mixture (as I ſhall anon ſhow theirs to be) do by a concurrent action produce thoſe wonderfull effects that are ſcarce to be match'd by Nature her ſelfe. And that theſe ſtupendious Operations really reſult from the proportion of the Ingredients, and the manner of their commixture, will be hereafter manifeſt.

Fourthly I conſider that notwithſtanding theſe ſeveral parts, whereof the compounded Body conſiſts, do in the proper, and if I may ſo call them, *Specifick* Actions of the Body ſo concurre as to performe them *joyntly*, and (as the Schooles in divers caſes expreſſe themſelves) *per modum unius*: yet theſe thus conſpiring Bodies

may each of them retaine thoſe attributes or that modification, which made it a diſtinct Natural Body before it came to be aſſociated with thoſe others, with which it makes up a more compounded Body.

And if it be proper to propoſe here an Argument *ad hominem*, I ſhall adde, that the more conſiderate of the modern Schoole-men themſelves doe, though perhaps unawares, teach ſuch things as do very well agree with the doctrine of Subordinate Forms. For when in the generation of man they tell us, that, as Ariſtotle alſo obſerves, the Embrio lives the life of a Plant and of an Animal, before he attains to live the life of a Man, 'tis plain that according to them upon the introduction of the Rational Soul the Vegetative and ſenſitive Souls that before ſucceſſively inform'd the Embrio do ſo no more, the advenient Humane Soul becoming now the true Forme of the Humane Body. And theſe preexiſtent Souls are not aboliſh'd, and doe not looſe their Being, but only their Office, which at firſt was to informe the Body of the Embrio, but now ceaſes, ſo that they are not *deſtroy'd* but only *depos'd*. And this conſideration ſeems to afford ground enough to admit in divers Natural Bodies Forms that diſpoſe the matter they modifie for the reception of a noble ſtamp, for which reaſon I ſometimes call them *preparatory Forms*, beſides thoſe more noted Forms that the Schools uſually terme ſpecifick (and which I

ſome-

ſometimes call predominant or ſupreame) by which I ſuppoſe is meant (to ſpeak intelligibly) the laſt and higheſt ſtamp, or modification that Nature gives that parcel of matter, whereas the preparatory Form is but (if I may ſo ſpeak) a Harbinger that diſpoſes the matter to receive a more perfect Form, which if it be not to be ſucceeded by any other more noble, is intitled the Specifick Form of that Body; as in the Embrio the vegetative and the ſenſitive Soul is but preparatory to the rational, which alone is ſaid to be the ſpecifick Form of Man.

But here I would not be thought to adopt for mine all thoſe Opinions upon which I think it allowable for me to argue with thoſe that own them. For I muſt not omit to intimate *in tranſitu*, that I elſewhere conſider with what congruity to ſome other of their Tenents *they can aſſert*, and in what ſenſe, in regard of the Nature of the thing it ſelfe, *we may admit* that the ſouls of All living creatures be the true Forms of their Bodies, notwithſtanding the ſcruples ſuggeſted to me, as by other things; ſo particularly by the great difference I take notice of betwixt ſome of theſe Animating Forms (if I may ſo call them) and other Natural Forms in reference to the manner of their informing the reſpective Bodies they belong to; of this to give an inſtance, 'tis evident that the *reaſonable Soule*, (which ſome call *Animus* to diſtinguiſh it from the *Anima* or Senſitive) is not the Architect of the Humane Body (which

(which they confeſſe and teach muſt be Organiz'd before it be fit to have That united to it) as many other Forms are ſaid to be of theirs; nor do all the properties or ſo much as all the Specifick ones flow from that Soul (whoſe manſion was a living Animal of a determinate kind before it was united thereto) as thoſe of other Natural compounds are held to flow from their Forms. And even in Beaſts and Plants (if we will rather conſider the Thing then mens Opinions) if the ſoul be all the Form, there will remain in the matter after the abolition of the Form great ſtore of Qualities, that by their ſo remaining ſhow that they do not flow from the Soul, as gravity is ſaid to flow from the Form of the Earth, and tranſparency from that of the Aire, and theſe ſurviving Qualities are oftentimes not only many, and ſeveral of them noble and ſpecifick, as appears in the beauty, fragrancy, and cordiall vertue of Oranges, Lemmons, &c. but oftentimes the ſame that were there in the Body, for ought our ſenſes can perceive, whilſt 'twas ſaid to be inform'd by the Soul. And I believe it would puzzle a Peripatetick to diſcriminate an Apple or an Orange which, having been pluck'd off from the Tree, were with a ſlender thred artificially ty'd on again by the ſtalk, from the other fruit as yet growing on the ſame branch. And not only the letters that were carv'd on the bark of young Trees, and grew with them, remain as fair and legible as ever

when

when the Trees are cut down; but a dead Body for ſome time after death (and it matters not how little a while, provided the Soul and conſequently the ſpecifick Form be really deſtroy'd or departed) does oftentimes ſo exactly retain the ſhape, feature, and even colour, warmth, and other qualities which it had whilſt the Soul (a little before) was there, that it often puzzles the beſt Phyſicians (eſpecially if the ſick Perſon were Hyſtericall or Apoplecticall) to diſcerne with certainty whether the Patient be dead or alive. And as for that conceipt of a *Forma Cadaveris* whereby divers of the Moderne Peripateticks have attempted to decline the inconvenience of allowing, contrary to the Doctrine of very many of their party, that the ſame qualities remaine *in corrupto* (as they ſpeak) as were in *genito*, and that in ſpite of their general and fundamental Tenent, the matter may be for ſome time, (how little ſoever it imports not) without a ſubſtantial Form: this Cadaverous Form, I ſay, that ſeems much to diſparage our ſences, (which witneſſe diverſe of the Remaining qualities to be the ſame they were before) ſeems to be deduc'd without any ground from the Phænomena of Nature, being introduc'd, (as * *Suarez* himſelf, though a friend to this Expedient, ingeniouſly confeſſes) but becauſe it is conſonant to the Peripatetick doctrine that it ſhould be ſo:

* *Diſput.* 15. *Sect.* 8. §. 16.

though

(though That it ſelf be not ſo evident but that *Scotus* and I know not how many of the Ariſtotelians themſelves *reject* this Form, if they do not alſo *deride* it.)

Nor need we be very ſollicitous how the parts of a dead Body can be kept together, if neither the Soul nor ſome new ſubſtantial Form that ſucceeds it, performe that office; ſince competent Agents whatever they were having contexed a portion of matter into ſuch a Humane Body as the Soul left upon its departure, the fabrick of the Body and connexion of the parts will ſuffice to make it retain for a little while (and that is enough for our purpoſe, ſince dead Bodies are not wont to remain long unalterd) their priſtine ſhape, and divers other manifeſt qualities, which may continue till the Action of outward Agents upon the leſſe ſolid parts of the Body, or the internal and inordinate commotions of the juices, and the ſofter though not fluid parts, that are contain'd in it, do by their degeneration vitiate the texture, and conſequently the manifeſt qualities of it. And if theſe inordinate agitations of the blood, Humors *&c.* be hinder'd, though by an externall cauſe the Body, notwithſtanding the loſſe of the Soul, will continue unputrify'd, not only for ſome houres, but for many Months together, as a learned eye-witneſſe whom I enquir'd of aſſur'd me, he, as well as many others have obſerv'd in very cold Countries as *Ruſſia*, *Sweden*, &c. where they often

often keep those bodies that dye in the winter unburied, and yet sweet, till the Spring, when the Sun's heat makes them begin to putrifie. And tis plain in some Aromatick gums and fruits that bodies that were once parts of Plants may, after they have lost the vegetative soul, not onele continue many years uncorrupted, but by embalming other bodies keep them so too.

But as I was saying, the prosecution of this enquiry (*whether in living creatures the soul be alwaies the true Form, to all the intents and purposes that the vulgar Philosophers would have it*) belongs not to this place, else I might also question the congruity of what is taught as well by *Sennertus*, as the Schools, that upon the supervening of the ultimate or specifick Form, the *Forms* that thereupon become subordinate, do but make a part of the *matter* inform'd by the new Form. I grant indeed that they may qualifie and dispose the several portions of Matter they belong to in such a way, as that they make the Body they consist of a fitter subject or receptacle for the ultimate Form that is to be introduc'd: and there may be a necessity of such previous dispositions in the subject, because the compounded body is of such a nature, as that no other bodies, but such as are thus and thus qualify'd, are fit to make it up. But it seems not to me so easie to conceive, how a Substance distinct from Matter (for such both He and they make their substantial Forms to be) can properly

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ly be ſaid to have its capacity confounded with that of the Matter. And notwithſtanding the lately mention'd diſtinction betwixt ſpecifick and preparatory Forms, thoſe (laſt nam'd) ſeem to me as true ones, whilſt they are either ſole or predominant, as the ſpecifick themſelves. For Bodies are what they are by the Matter and modification that do for the *preſent* conſtitute them, whatever they may prove to be in the *future*, and tis extra-eſſential to the Form that is ſaid to be *previous*, that it is to be ſucceeded by another which is ſaid to be more noble. A ſpring of Steel is a true and perfect Spring before it be made a part of the Watch, and by becoming ſo, it is not really better'd in its nature, though it be made indeed more uſeful to man: and when Copper is turn'd into Vitriol, Copper was a true and compleat Metal before, and tis accidental to the Copper that corroſive ſpirits coagulate themſelves with it into a ſalt-like ſubſtance. And Antimony is true and perfect Antimony before it be turn'd into Glaſſe, whether afterwards it happen to be or be not chang'd by the bare operation of the fire from a black and opacous mineral to a fine red and tranſparent Glaſſe.

And though I know, *Ariſtotle* attributes to Forms πιότητ ἢ ἀπιότας; yet tis not alwayes ſo eaſie duely to apply thoſe *civil* appellations to Phyſical things, and to determine whether a ſucceeding Form be more or leſſe noble then the precedent. As when, for inſtance, Pearls are reduc'd

duc'd by ſalts into a Chymical magiſtery, and Vitriol is made of Iron or Copper; where for divers œconomical and military uſes the metals themſelves are fitter then the magiſteries, (as in Gold-ſmiths ſhops and on Ladies necks, the entire Pearls are much more priz'd then the prepar'd ones) and for other purpoſes, eſpecially in Phyſick, which regards the health of man, the Magiſteries are better then the crude metals. And theſe inſtances put me in mind of taking notice, that as the ſupervening of a Form does not alwaies deſtroy the old, as in Vitriol (ſuch as I formerly mention'd) the Copper retains its metalline nature under the diſguize of a Salt; ſo upon the abolition of the ultimate Form the previous Form may in divers caſes be reduc'd to the exerciſe of its former functions; as out of ſuch Vitriol as I am ſpeaking of, tis eaſie, without the addition of any metalline ſubſtance, to recover true and malleable Copper. But I have dwelt too long upon this fifth Conſideration, which will invite me to make ſhorter work with thoſe that follow.

Fifthly, But before I proceed to them, it will not be amiſſe to intimate, that one may, if one pleaſes, make ſome diſtinction between Subordinate Forms, there being one ſort of them that may deſerve a peculiar name. For in Men, Horſes, Sheep, and other perfect Animals there are divers parts, eſpecially thoſe that Phyſicians call Similar (in oppoſition to Organical ones)

ones) ſuch as Bones, Ligaments, Membranes, which ſeem evidently to challenge peculiar and diſtinct Forms; for the diverſity of their nature being very manifeſt and ſtable, perſevering oftentimes a great while (as appears in bones) after the death of the animal, thoſe that allow that a Natural body is what it is upon the account of its Form, cannot well deny theſe ſo diſtinct bodies diſtinct Forms, which becauſe the bodies they conſtitute are the parts of a humane body, ſome modern Schoolmen have (not very inconveniently) call'd Partial Forms. But this diſtinction being not of ſo great weight, that we need inſiſt upon it, the notice already taken of it may at preſent ſuffice.

Sixthly I conſider, that among the conſtituent parts of an Animal or Plant there may lurk ſome Seminal principles or rudiments, that is, ſmall parcels of Matter of ſuch a texture, that though whilſt they remain aſſociated with the other parts of the compounded body, they are not by ſenſe (eſpecially when that is imploy'd with no greater attention then is uſual) diſtinguiſhable from the reſt of the compounded body, comes to have its predominant Form aboliſh'd, theſe Seminal principles or rudiments being ſet at liberty, and befriended by external heat, and the ſoftneſſe which uſually attends corrupting bodies, and perhaps by a lucky concourſe of other circumſtances may fall to act according to their own nature, and generate Inſects, Moſs, &c. as I have

have more amply declar'd in other papers. †

Seventhly I conſider, that beſides that when the ſpecifick Form of a Body is deſtroy'd, the change is not oftentimes ſo great as vulgar Philoſophers imagine; the corruption of the Animal or other body ought not to be look'd upon as if it happen'd in ſome of thoſe imaginary and empty ſpaces that are conceiv'd to be beyond the Univerſe, but in this World of ours, where the Body which is depriv'd of its ſpecifick Form is ſubject to be acted upon by the Sun, the Air, and I know not how many powerful Agents, by whoſe various concourſe with, and operations upon the body, either the preexiſtent though lately eclipſ'd Forms may be aſſiſted to ſet up for themſelves, or new Forms may reſult from new leagues and contextures of the particles that compoſ'd the body that loſt its *principal*, or if I may ſo call it, *ſoveraign* Form; (as we have largely diſcourſ'd in the lately mention'd papers.*)

Theſe Obſervations being laid down to avoid the neceſſity of too much interrupting our future diſcourſe, by being oblig'd to interpoſe ſome of the premiſ'd explications and other paſſages, as obſcure and difficult as we readily confeſſe the ſubject we are treating of to be, we ſhall now adventure to try, whether about *Sennertus*'s doctrine we can propoſe any conjectures, that

† Eſſayes about ſpontaneous generation.
* Eſpecially in the latter part or Eſſay.

being

being as agreeable to the *Phænomena*, as his, are congruous to the Corpuſcularian *Hypotheſis*, according to which we have hitherto diſcourſ'd of Forms.

And (to begin with a Conceſſion) I allow the learned *Sennertus* and his followers to be in the right, who without fearing the invidious title of Innovators aſſerted that in an Animal or a Plant there was ſomething elſe beſides the bare *materia prima*, and the vegetative or ſenſitive Soul with its eſſential faculties. And the inſtances they bring to ſhew that in ſome parts of ſuch bodies there may lurk peculiar Forms, which when the life of the Plant or Animal determines, come to diſcloſe themſelves, are probable enough; and the inſtances taken by *Sennertus* from the ſpecifick virtue that ſurvives in gather'd Plants, and particularly the above conſider'd purgative faculty of Rhubarb, are ingeniouſly alledg'd for their purpoſe. And tis probable too, what *Sennertus* according to their grounds teaches, That this purging property in Rhubarb, Senna, &c. as it does not flow from the vital ſoul of the Plant which is already deſtroy'd, ſo it does not proceed barely from the Form of a mix'd body as ſuch, it being no way likely that ſo great a variety of ſpecifick properties, as roots pluck'd out of the ground, and fruits torn from the tree are endow'd with, ſhould proceed meerly from that general Form, that belongs in common to compounded bodies

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as such. To which argument I forbear to adde that other, wherewith tis seconded by *Sennertus*, though he and others of several parties are wont to lay much weight upon it, namely that these properties flow from the specifick Form, which even in inanimate bodies is of a sublime nature, and must be the Author of such peculiar virtues, which according to him being far above the reach of Elementary qualities cannot be produc'd by any mixture whatever of the Elements: this argument, I say, I decline to urge in this place, because I elsewhere purposely examine it, and having declar'd in what sense onely it seems to be safely grantable, I reject the chief supposition on which it leans.

To proceed then to the next part of our discourse: Though (as I was saying) there be some things about the doctrine of subordinate Forms, wherein I dissent not from these learned men, yet there are others wherein I must confess my self unsatisfied, for neither do I acquiesce in some of the notions whereon they ground the things wherein we agree; nor do I agree with them in some of the main things they assert: and especially having in the past discourse rejected substantial Forms, it is not to be expected that we should either employ them in our explications, or admit those explications that necessarily suppose them.

They teach us indeed that the specifick Form of a body does command all the subordinate Forms,

Forms, and uſe them but as inſtruments to its own purpoſes, thoſe Forms belonging then to the matter which the Specifick informes and rules. But for my part that do not acknowledg in many bodies that are or may be ſaid to have ſubordinate Forms any thing ſubſtantial diſtinct from Matter, I confeſſe I do not readily conceive which way this dominion attributed to the ſpecifick Form is exerciſed, nor do I ſee any neceſſity of admitting any ſuch power in that Form, nor that the portions of Matter, that are endow'd with thoſe Forms that are ſaid to be ſubordinate, can, being under the degrees of Souls, and conſequently unfurniſh'd with knowledg and Will, pay this preſum'd ſuperintendent Form any obedience, I mean any other obedience, then ſome ſuch kind of one, as the parts of a Clock or Engine may be ſaid to yield to one another. I ſhould therefore rather conceive the matter thus, when divers bodies of differing natures or Schematiſms come to be aſſociated ſo as to compoſe a Body of one denomination, though each of them be ſuppoſ'd to act according to its own peculiar nature, yet by reaſon of the coaptation of thoſe parts, and the contrivement of the compounded body, it will many times happen that the action or effect produc'd will be of a mix'd nature, and differing from that which ſeveral of the parts conſider'd as diſtinct bodies or Agents tended to or would have perform'd. As when in a Ballance

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by putting in a weight into one of the ſcales, the oppoſite ſcale, though as a heavy body it will naturally tend downwards, yet by vertue of the fabrick of the inſtrument is made to mount upwards. And when an Archer kills a Deer with his arrow, the Bow being a ſpringy body naturally endeavours to unbend it ſelf, and the Spring being faſtned to the Bow, muſt neceſſarily follow the motion of It, and the ſhaft, though a heavy body, and, as ſuch, tending directly downwards, is by the forcible impulſe it receives from the Spring, thrown with ſuch violence (not directly downwards, but in a parabolical or ſome ſuch crooked line) as far more ſtrongly to hit the mark, then it would (if left to its ſelf) have ſtruck the ground: ſo that thoſe actions which *Sennertus* and others attribute to the conſpiring of ſubordinate Forms to aſſiſt the ſpecifick and preſiding Form, we take to be but the reſultant actions of ſeveral bodies, which being aſſociated together are thereby reduc'd in many caſes to act joyntly, and mutually modifie each others actions, and that which he aſcribes to the dominion of the ſpecifick Form, I attribute to the ſtructure and eſpecially to the connexion of the parts of the compounded body: As in a Clock, though all the parts it conſiſts of do contribute to the performance of thoſe things that belong to a clock as regularly as if they intended ſo to do, and did not onely concur but knowingly conſpire in

what they do, yet in all this there is no ſubſtantial Form to ſuperintend their motion; but the Lead (or other weight) tends downwards as it is wont to do, and the Hand, Wheels, and other parts do onely perform ſuch motions as they are forcibly put into by thoſe bodies, which by the deſcending weight (that does not in the leaſt intend what it effects) are themſelves ſet a moving. And notwithſtanding the prodigious operations that men admire in Gunpowder, yet not onely, as we formerly intimated, this ſtrange power is but the effect of the mechanical texture and of the way wherein the ingredients are mingled, and as it were contexed, but this artificial mixture is far more ſlight then thoſe made by nature are wont to be. For as the efficacy of the mechanical texture in Gun-powder may appear by this, that neither of the ingredients (whether the Sulphur, the Nitre, or the Coal,) is apart able to produce effects any thing neer like thoſe of Gun-powder: ſo to convince others how ſlightly the ingredients are mingled, I thought the beſt way was to ſhew how eaſily they may be ſeparated again; to which effect I beat good Gunpowder ſmall, and having boyl'd it a pretty while in a conſiderable proportion of fair water, by exhaling a ſufficient quantity of the well filtrated and limpid decoction, I obtain'd ſtore of Chryſtals, whoſe figure, taſt, and way of flaſhing upon a quick coal proclaim'd them to be good Salt-petre, the black ſtuff left in the Filtre remaining, if the Solution had been well

made, insipid enough, and when dry'd it will not blow up like the Gun-powder, but (in great part) burn along with a blew flame like common Brimstone. And for farther proof we may, by boyling this black stuff in a pretty strong Lixivium, dissolve the Sulphur, as will appear both by the smell that the Lixivium will acquire, and by this, that if you filtre it, though the Liquor will passe clear enough, and leave the black and coal-like part in the Filtre, yet by dropping into it some quantity of an acid liquor (I us'd spirit of Salt) the sulphureous smell will be increas'd, and the liquor will be made white by the precipitation of the sulphureous Corpuscles; whereas if I put spirit of Salt into that clear Solution, which (I was saying) afforded me the Chrystals of Nitre, the liquor not troubled by any such precipitation would continue limpid as before, which argued that the Salt-petre had not intimately incorporated any sensible quantity of the Sulphur with it self, but had been onely slightly associated with it.

And to illustrate what I said of resultant actions by an instance purely Physical, I shall subjoyn what I somewhere mention, with another aime, that by taking a couple of powders fit for my purpose, one blew and the other yellow, and mingling them in a certain proportion, the mixture exhibited a green colour, which did not flow from any new predominant Form which made the blew and yellow corpuscles subservi-

ent to its purpoſes, (for an excellent Microſcope ſhew'd me the blew and the yellow particles ſuch as they were before) but onely hence that from the mixture of thoſe bodies, the diſtinct actions of the blew and the yellow corpuſcles did upon the eye make a compounded impreſſion like that made by Bodies to whom their ſpecifick Forms are ſuppoſ'd to impart, among other qualities, Greenneſs. And when Vitriol or Sublimate are made by art, there needs nothing beſides the *manner* wherein the ſaline and metalline particles are contexed, either to containe the parts together, and keep them united into one body, or (notwithſtanding their not onely diſtinct but very differing Forms) to enable the mixture they compoſe, to effect *divers* things, which neither of them ſingle would have performed: nay and ſome of them ſuch things (as to vomit, purge, &c.) as merit to be reckon'd among ſuch ſpecifick properties, as many of thoſe are, which when preſerv'd in Vegetables, are thought to argue the conſpiring of ſeveral Forms under the direction of a ſuperintendent one.

And as in a Watch the Spring is really a Spring, and acts as a Spring whilſt it is a part of the Watch, though by reaſon of its connexion with the other parts it is reduc'd to concur with thoſe other parts towards exhibiting the *Phænomena* proper to the whole Engine; and though the Watch were taken all in pieces, the Spring would be a Spring ſtill: ſo in many compounded bodies, beſides the ſpecifick Form which the

Body has as ſuch, and which may be call'd its Total or General Form, particular bodies (by whoſe aſſociation and conjunction tis made up) may enjoy their own diſtinct Forms, which may therefore be call'd Partial ones, and theſe bodies, though whilſt the whole ſubſiſts they are part of it, and by their connexion with the reſt concur to the operations of the Body as ſuch, which joynt operations are wont to be thoſe that are attributed to the Specifick form, yet they do not alwaies ſo depend upon it, but that when tis aboliſh'd, they may retain their own nature; as a Bone will be a Bone ſtill, whole ages after the Animal it belong'd to is dead: whence we need not wonder that divers Forms ſhould ſurvive in bodies depriv'd of their ſpecifick form. For indeed thoſe that are call'd Subordinate may be as true and real Forms (nay and ſubſtantial Forms, if in any living creature, beſides man, there were any ſuch) as that which bears the title of Specifick, and even whilſt this is in being, there are many things which compounded bodies perform by virtue of their particular Forms, rather then upon the account of the Specifick: as (not to repeat the newly mention'd inſtance of a Spring) in Vitriol the friableneſs, tranſparency, and aptneſſe to mingle with water need not be attributed to the *compoſitum* as ſuch, but may, for ought we know, be due to the ſaline corpuſcles, which not onely retain their own nature, (as may be argu'd from ſome Vitriols

that I have made, ſince I have been able to ſepa-rate and recover them again out of the mixture) but to reduce the Metal they have corroded into a ſalt-like body with themſelves. And in Gunpowder tis manifeſt that the blackneſſe proceeds not from the *compoſitum* as ſuch, but from the Coals, as the Nitrous taſt does from the Saltpetre. And the fragrancy of a Roſe, whilſt it grows upon the buſh, need not be conceiv'd to proceed from the ſoul or life of the plant, ſince when tis gather'd it retains the ſame grateful ſmell.

And this laſt inſtance leads me to a farther conſideration, wherewith I ſhall conclude this Diſcourſe. We may call to mind what was obſerv'd a little after the beginning of it of the arbitrary, or at leaſt not ſufficiently ſettled uſe of the word *Form*, and that it not ſeldom happens that thoſe things, upon whoſe account we attribute this or that Form to a Natural body, are but very few of thoſe many attributes that belong to it: now the Form of a body being really no more then a convention of Accidents whereby the Matter is ſtampt and denominated, tis very conſonant to reaſon, that oftentimes hoſtile Agents or cauſes may deprive the Matter of thoſe Accidents which conſtituted the ſpecifick Form, and yet leave the reſt, which, according to the law of Nature, ought to continue there till ſome competent Agent put the Body out of that ſtate, wherein, upon the Form's deceaſe, it was left.

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And to clear up this matter we may consider, that the same Body may have a *twofold modification*, and be thereby fitted for two, if not more, states and kinds of operations, not necessarily dependent upon one another. For as the spring of a watch by virtue of one part of its texture is an Elastical body, and upon the account of another is Iron, and therefore though being cast red hot into cold water it will become stiff and brittle, and consequently cease to be a Spring, yet it will continue Iron, that is, a hard metalline body easily subject to rust, capable of striking fire with a flint, and of being attracted (as men commonly speak) by a Loadstone, and of attracting a Magnetical needle; so in a Rose, for instance, we may distinguish or consider a twofold modification of the Matter, *one* whereby it is fitted to receive from the bush it grows on a certain peculiar and spirituous sap, by whose intervention and concurrence it has nourishment and growth, and consequently exercises vital functions as a part of a living plant; and *another* which does not so much require the accession of fluid and moveable parts, but consists rather in the texture of the more stable parts, and this texture being commonly more permanent and durable then the other part of the modification, (consisting much in the peculiar motion of a fluid substance) wherein the life participated by the Rose consisted, may last when the Flower is depriv'd of its Soul and specifick Form by its

avulsion from the bush, and retain those qualities as well occult as manifest, that naturally result from a parcel of Matter so contriv'd.

I may somewhat illustrate my meaning on this occasion, by making a comparison betwixt a living creature, and a Mill. For as a Mill is capable of performing divers things onely when the water that passes through certain of its parts puts them, and by their intervention, others into motion: so there are divers things that are not performable by a Plant, unless when tis irrigated by a vital liquor. And as a Mill may nevertheless retain the nature of a structure useful for other purposes, though the drought of Summer have perchance made it loose, or the frost have congealed into ice the water that us'd to drive it: so although the soul of a Plant be destroy'd, or cease to act, the Body may upon the account of the more permanent structure of its stabler parts retain a fitness for divers of the same purposes it serv'd for before. And if it were here pertinent, the comparison might be carried on a little farther, by adding, that as when a Mill does upon either of the lately mention'd accounts cease to perform the peculiar operation of a Mill, as the wood, iron, and other materials of that Mill are not destroy'd; so neither does the water vanish into nothing, but either looses its motion, and by being congeal'd exchanges the name of Water for that of Ice, or else is dissipated and scatter'd into exhalations

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ons, which contain all the ſubſtance that ever the water had, that which is loſt being but the uſual manner of coëxiſtence of the Water and the Mill it was wont to drive: ſo when a Plant is pull'd out of the Earth, or a Roſe from the Buſh, as the diſmembred part of the Plant may retain the texture of its more ſtable parts; ſo the ſap or juice that were wont to enliven the body does, though inviſibly, remain either in the form of ſteams exhal'd into the Air, or perhaps in part condenſ'd and intercepted upon the loſſe of its wonted agitation in the imperceptible cavities of the fibres and other parts of the Plant, ſo that nothing that is ſubſtantial periſhes, but onely the particular modification that reſulted from the peculiar kind of union of the more permanent parts with thoſe congruouſly ſhap'd and fitly agitated fluid ones that permeated them. As to ſome purpoſes the example of a Windmill being ſet on work meerly by the impulſe of the air may be more appoſite then that of the Water-mill; but neither of them affords any more then an imperfect Compariſon in this regard among others, that whereas the Mill it ſelf by looſing, even for a very long time, the motion it was wont to be in, is not thereby conſiderably impair'd, becauſe of the ſolidity of the materials it is made up of; in Vegetables when that fluid ſubſtance, whereof the ſoul chiefly conſiſts, quite ceaſes to be influent, one of its chief functions being to repaire continually

tinually by assimilated or transmuted aliments the wast that was continually made of the looser parts in the body it belonged to, the same Agents or Causes that destroy the life of the Plant are wont likewise to produce or occasion such a discomposure in the texture of the remaining part (especially those that are more tender or more slightly connected) that they quickly become unfit to be animated again, though a fluid substance, like that which was wont to irrigate it whilst the vegetative life lasted, should be again communicated to it, but yet even in this regard the difference betwixt a Mill and a Plant is not alwaies so vast as one would imagine. For in Classick Authors we have relations of a Staff or a Pike made of a durable wood, that many years after the tree had been cut down, being casually struck into the ground, took root there. And as for the Rose of Jericho, as they call it, a late modern Writer, follow'd as I remember by another Naturalist of good account, affirms, that divers yeers after it is gather'd, and seems to be quite shrivel'd up and wither'd, it may by the help of water be so far recovered, as to be plump'd up again, and display its leaves almost as if it had not been long since gather'd. And I my self have, not without some wonder, observ'd how very long a plant of Aloes torn from the ground, and hung in the Air neer the seiling of my Chamber, would not onely continue succulent

culent, but (perhaps after ſome years) be capable of being made to perform acts that are wont to be aſcrib'd to vitality and growth, upon the dexterous adminiſtration of a convenient liquor: And even ſome Animals themſelves are not ſo very unlike to theſe Plants, and conſequently to Engines, as one would think. For that which children are ſaid to do for ſport about reviving drown'd Flies challenges a more ſerious conſideration then were fit for me to inſiſt on now, and deſerves to be both heedfully experimented, and ſeriouſly reflected on by a Naturaliſt. I choſe to try it chiefly upon Waſps and Bees, rather then upon Flies, becauſe their bigneſſe renders the *Phænomena* more conſpicous; and having drown'd them ſo, that if let alone they would not in probability have ever recover'd, I found that the heat of the Sun would recover them as well as it has been obſerv'd that warm aſhes would recover Flies; (ſo that theſe Tryals argue Celeſtial heat to be as little more as leſſe vital then Elementary) and the degrees and manner of their recovering again the operations of life ſuggeſted obſervations not unworthy to be taken notice of elſewhere, though not fit to be deliver'd here, where I ſhall not ſo much as mention what with warm Applications we have done to revive the expir'd motion of the parts even of perfect and ſanguineous animals, when they ſeem'd to have been kill'd: becauſe I fear that the excurſion I have

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unawares made already will be look'd upon as too much a Digreſſion.

Wherefore to take up my Diſcourſe where a while ſince I left it; I ſhall proceed now to obſerve that even in a Body that has loſt its ſpecifick Form, the noble qualities that remain do not alwaies flow from the Form of the entire body as ſuch, but from the peculiar Form of ſome particular parts of that Body, which being ſeparated from it, though perhaps the more ſtable parts that remain will keep the viſible ſtructure from being manifeſtly alter'd, yet this remaining body will be quite depriv'd of the noble properties we were mentioning; as may be gather'd as well from what has been above mention'd out of *Sennertus* about drawing an Extract from Rhubarb, in which its whole purgative virtue reſides, as in ſome preparations of Cinnamon, and divers other ſubſtances endow'd with fine parts, which upon the loſſe of thoſe parts remain but the carkaſſes of what they were. And even in the groſſe bark of Oke, Tanners find that when the water has extracted the diſſoluble parts, or time has waſted ſome ſubtle parts, and chang'd the texture of the reſt, though the bark retains its outward form, they cannot make uſe of it as they might have done before. And (as I formerly intimated *) beſides this preexiſtent and ſurviving modification, tis in divers caſes very poſſible that new qualities and pro-

* Eſpecially in the 5th. and 6th. Conſiderations.

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perties (whoſe principle may be call'd a Form) may be diſcloſ'd upon the aboliſhing of the ſpecifick Form, though they were not actually in any part of the Matter, but are produc'd in it by a concurrence of the texture and diſpoſitions left there by the late Form and the operation of external Agents. As when out of the fleſh of a dead Animal there is generated Musk; for not onely thoſe Seminal rudiments, that actually were latitant in the corrupted body, gain opportunity to ſet up for themſelves, and become perfect Inſects, or other creatures of their own kind, but the external Agents, to whoſe action, according to the common courſe of Providence, deceaſing Plants or Animals happen to be expoſ'd, do oftentimes (not without the foreknowledg of the moſt wiſe Author of Nature) ſo agitate the ſmall parts of the widdowed Matter, and perhaps by aſſociating themſelves with them, do ſo alter their texture, and thereby introduce a new modification, that by the conjunction of the former diſpoſitions that were regularly left in the Matter with theſe new Agents, promoted by a concourſe of favourable circumſtances, there may be produc'd new and noble Forms; (however not vital ones.) As when a Limeſtone, being calcin'd and left in the open Air, will in tract of time, as I have particularly obſerv'd, by the aſſiſtance of congruous particles it meets with there, and befriended by the more Catholick cauſes of Phyſical mutations,

ons, afford true and inflammable Saltpetre; and I have seen certain Marcasites, that being burnt and expos'd to the Air in convenient places would have such a change produc'd in their parts, as, after a due time, to afford an efflorescence, which both by the colour, taste, and operation appear'd to be Vitriol.

But of such matters no more at present. I will rather take notice, in prosecution of what I was not long since observing about the two-fold modification of living Creatures, that I fear we sometimes attribute to the Specifick form or soul things that may be well enough perform'd without it by the more stable modification of the Body, befriended by an easie concourse of natural Agents. Thus though the exclusion of Excrements be unanimously ascrib'd to the Soul, which for that purpose is said to be endow'd with a peculiar faculty that they call *Expulsive*; yet it has been observ'd and affirm'd by many, that diverse times the Excrements have been discharg'd out of the bodies of men a good while after they were unquestionably dead: so much (it seems) of the former structure of the parts remaining, as suffic'd to cooperate with the Excrements themselves, chang'd by the Death of the Animal, to that Exclusion. And thus (to add an instance of another kind) though the Maturation of fruit be a great, and, as the Schools speak, a *perfective* Alteration, which is suppos'd to be wrought by the Vegetative soul of

of the Plant; yet it has been vulgarly observ'd, that Apples and Grapes gather'd before they be ripe, and laid on heaps together, will ripen well enough afterwards; (and the example were more eminent in Medlars, if what some call their ripeness, others did not call their rottenness.) And very remarkable is that account which the inquisitive *Oviedo* gives the Emperour *Charles* the 5th of the *Anana's*, if I mistake not the name, which having mention'd as one of the considerablest fruits he met with in the West Indies, he takes notice, that though notwithstanding their largeness they grow in clusters, yet they must be gather'd whilst all but one are green. For as soon as the first begins to be yellow, the whole cluster must be taken off, leaving the rest to ripen, and attain to the same colour in the Chamber, which they will very well do. The learned* *Josephus Acosta* speaks thus of the fruit of the Plane-tree to the same. "This fruit (saies he) inclines more to cold then heat. — They are accustom'd to gather the boughs or clusters (as I have said) being green, and put them into vessels wherein they ripen being well cover'd, especially when there is a certain herb mingled with it, which serves for this effect. But the diligent *Piso*, speaking of those Brasilian plants which he cals *Pacoeira* and *Bananiera*, punctually relates that which comes up yet more fully to our present purpose. For not onely speaking

* *Acosta lib. 4. p. 269.*

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of the fruit, he ſayes*, *continentur plerumque in uno ramo quatuordecem aut ſedecem numero, ut ita una planta proferat ſeptuaginta aut octuaginta, qui ſubinde virides avulſi, nunc in ædibus, nunc in navibus ſuſpenduntur, donec juſtam maturitatem & flavedinem conſequantur*: But adds this memorable paſſage concerning the lopp'd boughs themſelves; *Ramus autem ille fructibus onuſtus, interea dum illi matureſcunt, augetur, floreſque ſemper protrudit ex corpore illo foliaceo*, &c. On this occaſion I might here adde, that even in our cold Climate, Onions and ſome other bulbous plants will in the Spring time ſhoot out of their own accord. And I have taken pleaſure to keep Potatoes in the Air, to obſerve how at that ſeaſon when they uſually begin to ſprout in the ground they would put forth leaves at ſo many of the little holes or dimples, as to give themſelves a verdant livery; but that not being willing now to examine whether or how far an Animated ſeed may have an intereſt in theſe laſt mention'd productions, I will rather take notice that even in Animals ſome things that are confidently preſum'd to be the proper effects of the Animals ſoul, may be really perform'd by the texture of the body, and the ordinary and regular concourſe of external cauſes. For (not here to repeat what I lately noted of the excluſion of Excrements in dead bodies) though the Nailes of a man are nou-

* *Piſo Natur. Hiſt. cap.* 21. *pag.* 155.

riſh'd

riſh'd, and do grow as well as other parts, and though the hair in moſt Animals be ſometimes, even in determinate parts of the Body, peculiar to the *ſpecies* of Animals to which it belongs; and though in man hairs do not onely grow but in the diſeaſe call'd the *Plica Polonica*, it appears to participate even of Blood, (ſince the haires being cut weep out that liquor) yet Nailes themſelves are obſerv'd to grow in dead men. And that they do not ſo onely (as is ſuppoſ'd) for a little time, whilſt the impreſſions left by the ſoul upon the Carcaſs are yet vivid and recent, but for a much longer while then has been imagin'd, I have been with pleaſure inform'd by a memorable obſervation I met with in the experienced * *Paræus*, who ſpeaking of a Body that he by imbalming preſerv'd for more then twenty five years he affirms it ſtill remain'd whole and ſound, and that, as to the nailes, he found that *having often par'd them, he ſtill obſerv'd them to grow again to their former bigneſſe.*

I know the Patrons of *Sennertus*'s opinion look upon it as a clear and cogent Argument to prove the ſouls performing almoſt all things done in the body, that in the corps of a man or other Animal newly dead, though the Organization remain the ſame, yet all the animal and vital functions perfectly ceaſe. But beſides that I have already taken notice that ſome things wont to be attributed to the ſenſitive

* *Paræus lib.* 28.

ſoul may be obſerv'd in a body avowedly dead, I confeſſe that this Argument ſeems to me, though very ſpecious, yet grounded upon what is but precarious. For though it may be true, that the viſible Fabrick may continue for a while without any manifeſt alteration; yet who can aſſure us that the internal Organization is not conſiderably chang'd and vitiated? For the body of an Animal is an Engine that conſiſts not onely of ſolid and ſtable parts, as Bones, Muſcles, Skin, &c. but of divers ſoft ones, as the Brain, Nerves, &c. and of ſome that are fluid, as the Blood, and other liquors, and, which is in our caſe exceedingly conſiderable, requires a *convenient* coaptation or compoſition of all theſe; whence it follows that the External Frame of the Body remaining unalter'd, yet upon Death there may be great and ſad alterations in the texture of the blood and humors, and in the contexture or ſtructure of other internal parts. And theſe changes may quite ſpoile the organization of the Body, and make it unfit to perform the wonted functions of ſuch an Engine. Thus we ſee that in dead bodies even whilſt they are warme the blood oftentimes coagulates in the veſſels, whereby the Circulation that grand Wheel of life is ſtopp'd. And in ſuddain Palſies, though there be uſually no viſible change in the affected limbe, yet it looſes ſence, or motion, or both: and not onely in Syncope's or great ſwoonings, and in Apople-

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xies a great part of the Animal functions for the time ſuſpended or unperform'd; but even in ſo natural a ſtate as ſleep, the body appears not to move, nor do Sounds and Odors affect the ſenſes as when one is awak'd, though the Soul be preſent in the body, and the Ears and Noſtrils be open. And how great changes in the nature of Liquors and conſequently of the Blood may be produc'd without any viſible alteration, may be gheſs'd at by what often happens in Wine upon Thunder: for that Liquor which was pleaſant, ſpirituous, inflammable before, ſpeedily degenerates into a ſowr and uninflammable Vinegar. Which Inſtance will not I ſuppoſe appear inconſiderable to thoſe many modern Philoſophers and Phyſicians, that would have Life maintain'd by a *Biolychnium* or vital flame continually burning in the heart, and fed by the ſpirituous parts of the circulating Blood.

It were not perhaps time miſpent to proſecute ſuch Inquiries as we have lately touch'd. But though I did not want leiſure, I ſhould be diſcourag'd by conſidering, that even ſome of the things I have already deliver'd may be queſtion'd by thoſe who take not the word *Life*, and ſome other terms by me imploy'd in the ſame ſenſe that I do. And indeed tis very difficult that men ſhould avoid falling either into miſtakes, or into unprofitable Diſputes, if they diſcourſe largely of ſuch Themes, where the names that are of very common and neceſſary

uſe have (yet) their ſignifications very little ſtated or agreed on. For *Life* (for inſtance) is a word whoſe meaning is not yet defin'd, and is apply'd to ſubjects that are exceeding different. For tis aſcrib'd not onely to all ſorts of Animals and Plants, but by many Chymiſts and Mineraliſts to Stones and Metals growing in the bowels of the Earth. Nor is it attributed onely to things Corporeal, but to thoſe that differ *toto genere*, as they ſpeak, from them, namely to ſeparate Souls, Angels good and bad, and to God himſelf. Nay, what that is even among animals wherein it conſiſts is not yet ſufficiently agreed on, as may appear by the Diſpute among the modern Naturaliſts, whether prolifical but as yet unhatch'd Eggs have life or no? and whether Flies be really dead in Winter, which ſome affirm them to be, not onely becauſe thoſe Inſects ſeem to be devoid of ſenſe and motion, but becauſe they place the notion of life in a conſtant Circulation of the blood or ſome analogous Juice, and a diſtribution of the aliment thereby perform'd to repair the Waſts of the Body; whilſt others on the contrary think them to be rather Benumm'd then Dead, becauſe regularly recovering the manifeſt actions of life in the Spring, (or oftentimes before, if a due application of heat be made unto them) it cannot be ſuppoſ'd that they were during the Winter really deſtitute of Life: Death being a Privation, which by Phyſical meanes admits not

not of a return to the former ſtate. Nor are the boundaries and differences betwixt the life of a Plant and that of an Animal ſo ſetled and defin'd, but that divers not impertinent Queſtions may be made about them; and particularly it may be doubted whether ſome parts, as Nailes, Haire, Hornes, &c. that belong to the body of an animal, may not for all that (even whilſt he is alive) have the nature of a Plant, to which the part where it grows ſerves as the Stock does to a Graft for a ſoyle, and is but an appropriated one. But to do more then point at ſuch matters would add too much to the digreſſions, of which I fear the paſſ'd Diſcourſe may be thought to be guilty already. I ſhall not therefore add any thing at preſent further about the ſubordinate Forms of Plants and Animals; but in regard I ventur'd about the beginning of this little Tract to aſcribe ſubordinate Forms to diverſe bodies that never had life, which I doubt will ſeem a Paradox to many, I think it will not be amiſſe to apply the chief points of our doctrine about ſubordinate Forms to Inanimate bodies, becauſe this courſe, as it will invite me to make ſome new though ſhort Additions to illuſtrate and enlarge ſome points; ſo it will help to recall to your memory moſt of the heads of that Doctrine, which the ſeveral Excurſions whereto divers ſubjects tempted me, may have kept you from taking a diſtinct view of. And for orders ſake I ſhall caſt the main things I would have

conſider'd into diſtinct Propoſitions with ſhort Comments annex'd to them, having onely intimated in general once for all, that you will not I hope wonder that I ſhould often uſe for Examples ſuch Bodies as are look'd upon as factitious, if you recall to mind what I have formerly ſaid to ſhew, that the difference betwixt them and thoſe that are confeſſedly natural is not alwaies near ſo great as men are wont to imagine. To which I ſhall now adde, that in the following diſcourſe they are often imploy'd not ſo much to prove as to illuſtrate the notions on whoſe occaſion they are alledg'd, which ſure they may very properly do. And among the Bodies themſelves in whoſe production man's power or skill has a ſhare, I reckon that there is a great difference between thoſe, wherein man gives an outward ſhape, ſuch as himſelf deſigns by tools of his own making, that are alwaies external to the produc'd Body, and thoſe (ſuch as are moſt Chymical productions, beſides others) wherein his chief work is to apply Phyſical Agents to Patients, by which means it oftentimes comes to paſſe, that (as in productions that all allow to be natural) the Inſtruments he works by are parts of the matter it ſelf he works upon, or at leaſt intrinſecal to it. But of this more perchance elſewhere, I come to the Propoſitions themſelves.

I. The word *Forme* is of a ſufficiently indeterminate ſignification. This

This I have already had occaſion to ſhew, and it can ſcarce be deny'd by them that ſhall conſider though it be a Technical word or term of Art, yet men have not intelligibly defin'd and agreed on how many or what things they are ſufficient to intitle a Portion of matter to a determinate and diſtinct Form. For beſides that there are I know not how many Bodies, ſuch as Treacle, Beer, Gunpowder, Coal, Ink, &c. about which men ſeem not ſo much as to have conſider'd whether they ought to have particular Forms aſcrib'd to them, (or to be look'd upon onely as factitious things) there are other bodies that have been taken notice of, about which even the Peripateticks diſpute whether they ought to have particular Forms allow'd or no. For not onely Ice is by ſome made to be a diſtinct kind of natural body, whereas others will have it to be onely water alter'd, and thereby depriv'd of its Fluidity, not its Form, but even touching the Elements themſelves the Schoolmen fiercly diſpute, a whole party denying them to have any other Formes then the firſt Qualities by which they are wont to be diſtinguiſh'd. If I affected Paradoxes I might here add, that perchance there may be bodies, which as they may be diverſly conſider'd, ſeem to have a title to more then one Form, and upon that ſcore may puzzle the Schools about the aſſignation of their Forms. When, for inſtance, I have (though not without ſome difficulty) re-

duc'd Lead *per ſe* into a body like that which Chymiſts call *vitrum Saturni*, and which they make by the addition of Flints and Sand, tis not eaſie to determine whether this ſhall be one of thoſe kind of bodies that are call'd Metals, and in our inſtance is onely diſguiſ'd, or belongs to that other kind of Bodies we call Glaſſe: for it ſeems to have the properties of both. For like Lead tis very ponderous, and diſſoluble in *aqua fortis* and ſpirit of Vinegar, which diſſolve not common Glaſſe, it affords a very ſweet Solution as Lead is wont to do, and, which is more, it may without addition by bare heat be quickly reduc'd in great part into true and malleable Lead. On the other ſide, it is a body fuſible, tranſparent, and brittle, which are the three grand properties of Glaſſe; beſides which I have obſerv'd in it ſome others that will be more properly taken notice of elſewhere. So likewiſe when Miſletoe grows (as I have ſometimes ſeen it) to a very great bigneſſe on a Hazle, which (you know) is but a very ſmall tree, or when an Apricock or Peach is inoculated and proſpers upon the bough of a Plumtree, the reſt of whoſe branches bare Plums as they did before, (to which I might add ſome inſtances of trees that I have ſeen to bear more kinds of fruit) and when red or blew Amel is made, which conſiſts of calcin'd Tin, which they call *Putty*, and of the Salt and Sand (or fuſible ſtones) whereof the Glaſſemen make what they call their *Fritta*, and

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of ſome burnt Copper or ſome other Metalline Pigment, moſt, if not all, of which ſo differing Ingredients may perchance be reobtain'd out of the Amel, which has divers properties of the reſpective Bodies it conſiſts of, and yet wants others of them, if I ſay ſuch Examples as theſe, to which I could adde ſeverall others, were propos'd, 'twould perhaps ſomewhat perplex the Schoolmen to accommodate them fairely to the vulgar Doctrine of Formes, at whoſe framing probably ſuch Inſtances were not dreamt of.

II. 'Tis not eaſy to decide the nobleneſſe of Formes.

This point alſo has been partly handled already, which will make it the leſſe needfull to inſiſt long upon it, and indeed beſides that *nobleneſſe* is rather a Civil or Political then a Phyſicall Qualification, 'tis oftentimes difficult enough to determine ev'n in this ſenſe of nobleneſſe, which of the two Formes is the moſt noble. Of this difficulty we have already elſewhere given ſome Examples, to which we may adde beſides the lately mention'd Inſtance of the Glaſſe of Lead, that of Antimony made *per ſe*, crude Antimony being fitter for ſeverall purpoſes both mechanical and medical then the vitrify'd Calx, and this againe being better for divers other uſes, then that which has not been freed from its more fugitive parts.

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It ſeemes it was diſputable among the Antients whether or no their *Electrum* (which learned men tell us was a Compoſition of Gold and Silver) was a nobler thing then either of thoſe metalls. And it may be queſtion'd whether when Chymiſts have made a precipitate of Gold and Mercury, the produc'd powder be a nobler thing then the Gold alone. For Chymiſts think it worth while to put themſelves to much trouble and ſome charge to bring Gold by the Addition of Mercury to this new ſtate; and therefore if a Spagyrical Phyſician were Judge, he would think that in ſuch a Medicine the Gold is *improv'd* by the change: but if a Goldſmith were to be Judge, he would conclude that Gold being the nobleſt of Metals, an *Alloy* muſt needs *imbaſe* it, and he would take the paines by melting it with *Borax* or ſome other Additament to free the Gold from the Quickſilver, and reſtore it to its priſtine Forme.

It may alſo be diſputed whether though in living Creatures the ultimate Forme be wont to be more Noble then its previous Harbinger, it may not be ſometimes otherwiſe in Bodies Inanimate, as well as in the Productions of Art. I will not urge for an Example to this purpoſe, that when Corne is ground in a horſe-mil though the whole Aggregate conſiſting of the Horſe, the wheeles, Grindſtones, and other parts of the Mill be look'd upon but as one Engine in reference to the uſe of the whole, which is comminution

minution of Graine; yet the horſe though contain'd in the Mill and look'd on as a part of it is of a much nobler nature then the Engine to whoſe Effects it cooperates. This Example, I ſay, and others of the like kind, (as that of a Turneſpit-Dog (included in a wheele to make it go round) I ſhall not preſſe, but rather give this for an inſtance, that when an Artificer who makes Silver Soder addes to the Silver a certaine proportion, (which I have elſewhere ſpecify'd) of Braſſe or Copper, and melts them together though he thereby obtaines a mixture of good and frequent uſe for joyning together the pieces of Braſſe and Silver Inſtruments and ſtopping holes and cracks in them, yet it may be much queſtion'd, whether this brittle ſubſtance be not leſſe Noble then the Silver alone was. And when a Plant that grows by ſome petrifying Spring by Imbibing that water is at length turn'd into a Stone, though the Rarity of ſuch things makes men prize them; yet it may well be queſtion'd whether the ſupervenient Forme be not leſſe Noble then that which the Plant had before.

III. In divers Bodies the Forme is attributed upon the account of ſome one eminent *Property* or *uſe*; which if it be preſent and continue, though many other things ſupervene or chance to be wanting, the matter is nevertheleſſe look'd upon as retaining its Forme, and is wont to be allow'd

allow'd its uſuall Denomination.

An Example of this we may be furniſh'd with by our lately mention'd Inſtance of *vitrum Antimonii*: for the Account upon which we take a Body to be glaſſe being chiefly fuſiblenes and tranſparency, this Antimonial Preparation by virtue of thoſe Qualities paſſes without ſcruple for glaſſe, and would in Effect be taken for Yellow or Red glaſſe, (according as it happens to have more or leſſe of Tincture) by an indifferent Spectator who were ask'd what it is. And yet this ſubſtance is not onely by its ſolubility, unfixednesſe, and diſpoſition to afford a Regulus, very differing from common glaſſe, but retaines ſo much of Antimonial nature and Properties as to be Vomitive & Purgative, as well as *Crocus metallorum*. It can ſcarce be unknown to Chymiſts, that there is a vaſt difference between thoſe Liquors that are expreſſ'd out of Olives, Almonds, and other unctuous vegetables, and thoſe fine *Eſſential oyles*, as they call them, which are drawn by the help of water in Limbecks; and even of theſe, ſome are wont to ſwimme upon water, as Oyle of Anniſeeds or Nutmegs, others to ſubſide as the Oyle of Cloves and Cinnamon *&c.* well drawne, and all theſe Eſſentiall oyles are very differing from the oyle of Guajacum or of Box and other Empyreumaticall oyles, that are di. ſtill'd in Retorts by the violence of the fire; and theſe do as much differ from expreſſ'd oyles

as

as from Essential ones: and yet all these so differing Liquors are reckon'd among *oyles*, because they agree in this, that they are fluid Bodies, unctuous to the Touch, and mingle not with water. And so although some sorts of salts be very fugitive, (as the volatile salts of Harts-horne, Urine *&c.*) others very fix'd (as that drawn from the Calx of Tartar, and from the Ashes of Wormewood; Ash, Celandine and other Plants;) and though some saline Liquors as vinegar and Juice of Lemmons are acid, and dissolve Pearle, Coral, *&c.* which Lixiviate Salts, whose Tast is fiery, will precipitate what the others have dissolv'd, yet all these are numbred among *Salts*, because they agree in the Accounts upon which we allow bodies that Denomination; namely their being very sapid and readily dissoluble in water. Examples to the same purpose with the foregoing I could give you in Flame, Smoak, Glasse, Coale, and divers other sorts of Bodies. And indeed by reason of the unsetled notion and almost arbitrary use of the Word, *Forme*, I have observ'd it to be so uncertainely apply'd to the constituting of the distinct *Classes* or kinds of Bodies, that I have doubted whether divers of those Formes by which such kinds are constituted be not a kind of *Metaphysical Conceptions*, by vertue of which bodies very differing in nature are compriz'd in the same Denomination, because they agree in a fitnesse for some *use*, or in some other

other thing that is common to them all (as whether a Bullet be Silver, or Braſſe, or Lead, or Corke, if it ſwing at the end of a ſtring, 'tis enough to make it a *Pendulum*, and whether a burn'd body be chalk, or Rag-ſtone (which is very hard and coarſe) or Alabaſter, which is a ſoft and fine ſtone, or an Oyſter-ſhell, or a cockel-ſhell, or a piece of Corall; yet if it have been calcin'd to whiteneſſe 'tis Lime, rather then ſuch true *Phyſical Formes*, as are ſayd to make the Bodies that have Formes of the ſame Denomination to be of the ſame ſpecifick Nature. However, theſe Formes ſeem to be very Generical things, and more ſuch then is commonly heeded. And I have alſo ſometimes queſtion'd, whether ſome of thoſe things, upon whoſe ſcore men conſtitute Bodies in this or that ſpecies or Claſſis, be ſo properly the true and intrinſick forms of thoſe Bodies, as certaine ſtates of matter, wherein Bodies very differing in nature may agree. As water, wine, and I know not how many other differing Liquors may each of them apart be made by congelation to paſſe into that ſort of Body we call Ice. And not onely the Tallow and Greaſe of Animals, and the expreſſ'd oyles and ſpirits of fermented vegetables, (ſome whereof differ exceedingly among themſelves) but alſo (as I have tryd) divers mineral and ev'n metalline Concretes may be made, (ſome of them without diſtruction of their nature) to paſſe into that Claſſis of Body we call Flame.

IIII. By

IIII. By reaſon of the Conjunction or Connexion of the parts that make up a *Totum*, (or at leaſt an Aggregate of Bodies that for their connexion are look'd upon as ſuch) it will often happen, that ſeverall things will be perform'd by the joynt or concurrent Action of theſe united (or coherent) parts.

Theſe kinds of Operations are of kin to thoſe mention'd by the Schoolemen when they tell us that ſome things are done by diverſe Agents *Actione Communi*: as when a man diſputes *vivâ voce* Syllogiſtically, the Rational Soul, which dictates the words, and the vocal Organs, that pronounce them are *actione communi* the Efficients of the pronounc'd Syllogiſme. But to give an Inſtance nearer to our purpoſe, when a Bullet is let fall upon a level Pavement, though it touches the Body it falls on but in a very ſmall part of its ſuperficies (Geometricians having demonſtrated that a perfect ſphere can touch a perfect Plane but in one Point) yet the Plane receives the Action of the Gravity of the whole Body; thoſe parts that doe not immediately come to touch it ſtriking it nevertheleſſe by the Intervention of thoſe that doe. And ſo likewiſe in a Boat, the Limbs and cloaths of a man that ſtands upon the deck, and all the parts of a Watch, if he carry one in his Pocket, gravitate concurrently on the veſſel, though only the ſoles of his Feet or Shoes doe immediately

preſſe

preſſe upon it, and the wheels and other parts of the watch may be moving at the ſame time very differing ways. Now in Organical Bodies and diverſe others both Natural and Factitious, thoſe things that are perform'd by the Parts as in a ſtate of Conjunction, and as it were, Conſpiring, or (if you wil have it ſo expreſſ'd) *Actione communi* (which Action may ſometimes be *Succeßive*) are oftentimes aſcrib'd to the forme: as in a Watch, moſt of the chiefe of the Phænomena do ſo depend upon the concurrent Action of the ſeveral parts, that few of them can be out of order, but that they will hinder thoſe Phænomena to be at *all*, or at leaſt to be *well* and *regularly* produc'd.

V. Wee may yet in a ſound ſenſe admit that in ſome Bodies there may be ſubordinate Formes.

What I meane by a *ſound ſenſe* in this Propoſition *may be* clearly collected from ſeveral paſſages of the paſt and remaining parts of this diſcourſe, where we carefully exclude thoſe ſenſes in which we do not allow the receiv'd Doctrine of ſubordinate Forms. Wherefore having met with a couple of plauſible objections ſtarted ſince the Death of *Sennertus* againſt the admitting them at all, We ſhall here briefely examine them, not only to make them appear not to be cogent, but becauſe ſome of our Anſwers may ſerve for Reaſons why we admit the Formes diſputed of. The

The first Argument we are to consider is, that a Body can have but one Form being but one body.

But though to this I might frame an answer from the loose and indeterminate signification of the word *Form*, yet it may be directly reply'd, that though a Body can have but one total and adequate Form, yet nothing hinders but that its parts may have their partial Forms subordinate to That: As the Steel-spring and the Brass-wheels of a Watch may retain their distinct metalline Forms, though the Watch they compose be but one. And tis not wholly to be pretermitted on this occasion, that among the Schoolmen themselves there has long been a considerable party, who asserted with many of the Antients, that in compounded bodies the Elements retain'd their respective Forms, notwithstanding the new Form that belong'd to the mix'd body as such.

Secondly, 'tis objected against the superveening of a higher Form, that a Body being already compleat in its own kind by its own Form, no other Form can accrue to it, without making that which they call *Ens per accidens*.

To this I answer, that the notion of an *Ens per accidens* belongs rather to Metaphysicks then Natural Philosophy, and in what its Essence consists is still so hotly disputed among the Moderns, that till the business be agreed on,

or at leaſt more clearly ſtated, an Argument drawn from thence will not much preſſe us. And indeed when I conſider, that the Schools themſelves are fain to allow the Soul and the Body, that is, an immaterial ſubſtance and a corporeal, to make up a man, who according to them is *unum per ſe* and not *per accidens*, and that the ſame Schools ſcruple not to teach, that the Rational ſoul which is a ſubſtance, and the Underſtanding and Will, which are ſaid to be its Faculties, and ſo its Accidents, to make *unum per ſe*; I cannot but think that, by a parity of reaſon, that name, Prædicate or Qualification, may well be taken in as large a ſenſe as is requiſite for our purpoſe. And indeed if the parts of a Body, whether meerly natural or factitious, be by their union or conjunction brought to become the principle of a Property or Operation, which belongs to neither of them ſingle, I ſee not why ſuch a Body may not paſſe for *unum per ſe*, as well as divers bodies that are wont to be look'd upon under that notion. But to proceed to our further Anſwer, not here to urge, that a whole ſect of the Peripateticks themſelves maintain'd (as we newly noted) the Forms of the Elements to remain in the mix'd body, which notwithſtanding they hold to be very conſiſtent with the unity or *Oneneſs* of that compounded Body, it may be anſwer'd further, that though a Body by its own Form be compleat in its own kind, yet

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it may be such as to be capable of being advanc'd to a nobler state by an Accession that shall not ruine its former nature, but enable it to cooperate to nobler actions then its former could reach to. As when a Spring is made a part of a Watch, it does thereby without loosing the nature of a Spring mainely contribute to the noblest *Phænomena* of so curious an Engine; and the Ingredients of Gunpowder by the superinduction of the Form or new Contexture they acquire by being compounded into that Concrete are each of them ennobled to cooperate to the performance of things far exceeding the utmost it could do before. Nor will it follow from this superinduction of Forms, that there may be a Form of a Form as well as of Matter, but onely that to a Body that has already a Form an ulterior Form may supervene, wherein we see no absurdity. But of this point more elsewhere, onely in this place it will not be amisse to take notice, that in our proposition we thought fit to imploy the words, *some Bodies*, and, *may be*, because that though in living creatures we may often meet with subordinate Formes either properly or lesse improperly so call'd, yet that in bodies Inanimate this happens not so often, you will be induc'd to think by what you will find said upon the last Propositon of this Discourse.

VI. The supervening of the new Form is

often but accidental to the præexiſtent Form, and (then) does not at all deſtroy its nature but modifie its operations.

For illuſtration ſake let us conſider a Needle, that is not yet touch'd by a Loadſtone, this needle has its own Form as a piece of Steel, as well as its Figuration as a Needle, but when afterwards it comes to be excited by the Loadſtone, there are then new and wonderful properties ſuperinduc'd, and this Needle is able to point regularly North and South, and attract other Needles, and communicate a verticity to them, and is fit for much nobler uſes then twas before. And this new modification does ſo regulate its motions, that whereas before it was indifferent if it were nicely poiz'd to reſt at Eaſt and Weſt, or at any other points of the Compaſſe, it is now determin'd to keep moving till it points North and South, and to reſt in that poſition. And yet by drawing this magnetick Needle after a certain manner upon the Pole of a vigorous Loadſtone, you may in a trice deprive it of all its acceſſional faculties, notwithſtanding which it will remain as true a ſteel-needle as it was at firſt.

And perhaps we ſhall need to add but a little Reflexion on the formerly mention'd Inſtance of the Spring of a Watch, to declare intelligibly what it is that the ſtructure or modification, whence the *Forma totius* according to us reſults, does to a body endow'd already with its own Form,

Form. For as the Spring, though it retain its own nature, and acts according to it, yet by the contrivance of the Watch, it is not onely so pent in that it cannot fly out to its full extent as else it would, but by the same contrivance has its incessant Endeavour to stretch it self so moderated and manag'd by the Wheels and Ballance, that it mainly concurres to set all the other parts a moving, and perform what is done by a Watch as such: so in Natural bodies that which is perform'd by the supervening of a higher and Total Form is, that by virtue of the connexion and structure of the parts introduc'd with this new Form, the action of the particular parts, though they retain their own partial Forms and act as far as they can according to them, is so master'd or otherwise modify'd, that they are brought to concur to those things that are done by the whole Body as one Agent, and become subservient to the operations that are proper to the Body in its new and ultimate capacity. So when a piece of Lead is without addition vitrifi'd by the meer action of the fire, This happens to the Body upon its acquiring the Form of Glasse; that whereas before the metalline particles were so inconveniently situated and perhaps shap'd, that they deny'd passage to the beams of light, and by reason of their contexture

compos'd a Body that was very flexible, they become now to be so rang'd and otherwise alter'd that they freely admit the light to traverse them, but admit not of being freely bent as before. And when Salt-petre by the addition of a small proportion of Brimstone and Coal is made into Gun-powder, this accrues to it from its acquir'd modification, that if a little fire fall on it, it will not as before leisurely consume and leave behind it a considerable portion of the whole body (perhaps a third part or more) in the Form of a fix'd or alkalizate salt, but will fly away all at once, and leave little or nothing behind it.

VII. Besides the specifick actions of a Body that harbours subordinate Forms, there may be diverse others, wherein some of the parts or ingredients may act according to their particular and pristine nature.

This might be well enough gather'd from what we lately deliver'd, when we shew'd that the Total and specifick Form has not such a Dominion over the partial and subordinate ones, as the Patrons of these Forms have imagin'd. For though by virtue of the modification of the whole the operations of the parts or Ingredients are so compounded and guided, and in some cases as it were over-

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rul'd as to concur to those operations that belong to the *Totum*, as such, and are requisite to be perform'd *actione communi*; yet in other respects, and as to other purposes as it is not necessary that such Bodies as we speak of should have their parts entirely under the dominion of the ultimate Form, (that is, subservient onely to the operations and uses of the *Totum*, as such,) so those parts may in such cases act according to their distinct and particular qualifications. This answer, I say, may be deduc'd from what has been above deliver'd, but I chuse rather to clear the matter by two or three particular Instances, which may shew that the same may happen to several Bodies that is manifest in a Watch, where though the forme of the Engine do in many things make the Springs and Wheels and other parts concur to perform the operations proper to such an Engine, yet the wheels may look bright and yellow, the Spring may move a magnetick Needle freely plac'd, and other parts may do other things not by virtue of the Form of the Watch, but by virtue of their own Qualities. An Example to this purpose may be afforded by what I remember I have not long since mention'd concerning Gun-powder. To which I shall now adde, that whereas in Pills and divers other medicines made up of several in-

gredients; the *Compoſitum* has, if the Phyſician do his part well, ſome reſulting virtues diſtinct from thoſe of the Ingredients and belonging to the *Compoſitum* as ſuch: it may oftentimes happen, that notwitſtanding the emergent Form of the compounded medicine, ſome particular Ingredient may not only retain its former nature, but ſo retain it, that the *Compoſitum* is endow'd with that Quality onely upon the ſcore of that Ingredient. This I have divers times obſerv'd in certain Pills, wherein good Ambergreece, being mingled with ſome purgative ingredients, retain'd its own grateful ſmell, and communicated it to the whole maſſe, whereof the Pills are made: and the moſt ſort of purging Pils in our Apothecaries ſhops taſt ſtrong of the Aloes whatever the other ingredients be. And a further inſtance (and that a conſiderable one) we may take from Treacle that hath not been too long kept. For though it be acknowledg'd that *Opium* works by a ſpecifick, and, as they call it, Occult quality, and though it be in (Venice) Treacle blended with above threeſcore other ingredients, moſt of which enter that famous Compoſition in far greater quantity then does the Opium; yet in ſpight of the *Forma Compoſiti* which ſo elaborate a mixture produces, and to which ſuch great peculiar virtues are aſcrib'd

aſcrib'd by Peripatetick as well as other Phyſicians, yet it is noted by many that before Treacle growes old it manifeſtly derives an Opiate Quality from the little Opium admitted in it, and upon that account is a potent Remedy in Fluxes and divers other diſtempers, where quieting medicines are proper. A no leſſe evident Example to our purpoſe we have in the precipitate of Gold and Mercury made by heat alone. For though by vertue of the union of the Ingredients the reſulting Powder may have divers Qualities, as particularly, a red colour which neither the Gold nor the Quickſilver had apart, yet the ſalivating Faculty which this precipitate uſually, though not alwayes, exerciſes, though it be reckon'd among occult Qualities, as not having by any been deduc'd from the firſt or ſecond, yet it belongs to this Medicine barely upon the account of the Mercurial Ingredient: the Gold without that having no ſuch Faculty, and Mercury alone without Gold being ſufficient (by more ways then one of application) to cauſe a flux of ſpittle.

VIII. In divers Bodies that which is call'd or look'd upon as the ſpecifick Forme is often not ſo much as the Preſiding, but only the Eminenteſt.

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To make out this we may take notice of the following particulars. 1. We obſerv'd above, that the word *Forme* has not a ſetled and determinate ſignification, but is imploy'd arbitrarily enough; ſo that divers Bodies to whom particular Formes are uſ'd to be aſſign'd deſerve not that Priviledge better then many others, in which (perhaps for want of mens having particularly conſider'd *them*,) they are not wont to conſider any peculiar and diſtinct Forme. 2ly. We have alſo elſewhere ſhown that the Formes of Inanimate Bodies (which we here ſpeak of) are wont to be but *reſpective* things reſulting from the coexiſtence of ſuch Corpuſcles or parts after ſuch a determinate manner. 3ly. It may likewiſe be remembred what we have already noted, that 'tis uſually from ſome particular *reſpect* or for a fitneſſe to ſome particular *uſe*, that men aſcribe this or that Forme to this or that Body: as we exemplify'd in oyles, Salt *&c.* as well as in Watches, Burning-glaſſes, and the like. 4ly. To theſe things it will be agreeable, that the nature and Fabrick of a Body may be ſuch that it may have a manifold ſtructure (if I may ſo ſpeak) anſwerable to more then one of thoſe reſpects, on whoſe ſcore Bodies are *denominated*, or may be fit for more then one of thoſe uſes; an aptitude for which, when 'tis found ſingle in another

another Body, is ſufficient to make it be referr'd to this or that diſtinct kind or *Claſsis* of things Corporeal. I cannot in few words expreſſe this notion more clearly, and therefore ſhall illuſtrate it by the Example of Antimonial Glaſſe: For one that would make Beads or Microſcopes with it would readily find in it fuſibleneſſe and tranſparency; which, when they are found in Common glaſſe or *vitrum Saturni* are enough to referre them to that ſort of Bodies that are comprehended under the name of Glaſſe. But beſides this Combination, or (if many convene) this Conjugation of Qualities, or (to expreſſe it in one word) beſides this *modification*, the Body we ſpeak of has another, upon whoſe account it is yet to work upwards and downewards in a humane Body, upon which ſcore, as the Artificer conſiders it onely as glaſſe, ſo the Chymiſt and Phyſician look upon it as a medicine. 5ly. Nor is it neceſſary that theſe Conjugations of Qualities, or (theſe) *modifications* ſhould have a ſtrict dependency upon one another, as for inſtance, The Emetick and Cathartick properties of the Antimonial Glaſs belong not to it as Glaſs, or (if you pleaſe) do not flow immediately from the Forme it hath of Glaſſe, for neither has common Glaſs, nor (that we know of) Glaſs of Lead any ſuch properties, nor is it neceſſary that if this very

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ry portion of Matter had not the Forme of Glaſſe it ſhould want or looſe theſe properties. For the Calx of Antimony before it's Vitrification had them; and you may even without addition obtaine from this Glaſſe a Regulus that is not, like glaſſe, tranſparent, but looks like a Metalline Body, under which Forme it may yet preſerve the vertues of the calcin'd Antimony. 6ly. To theſe things it will alſo be congruous, that ſince, as was ſayd above, the nobleneſſe or ignobleneſſe of Formes is not eaſy to be decided, and is wont to be meaſur'd by men by the greater or leſſer uſe that the Eſtimated Body affords them, one man may in the ſame body look upon one kind of modification, and another upon a quite differing one as the higheſt Forme of that Body. As in the lately mention'd Example of the melted Calx of Antimony, an Artificer may think its nobleſt Forme to be that of Glaſſe, and a Chymiſt or a Phyſician that of Antimony. And ſo if an ordinary Watch, that ſhowes onely the houres and their Quarters, being hung at a ſtring were made to ſwing as a Pendulum, to an Aſtronomer or ſome other that were to make nice obſervations it would be moſt uſefull in the Capacity of a Pendulum, becauſe, as That, it may divide a minute into ſeconds, and a ſecond it ſelfe into halfe or fourth parts: but

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for other men, who though they need an Instrument to measure time, need not such minute Subdivisions of it, the little Engine we speake of will be much more useful and considerable in the capacity of a Watch then of a Pendulum. 7ly. From all which particulars it will be reasonoble to collect that it may often happen in Inanimate Bodies, whether confessedly *natural*, or such as are call'd *factitious*, that that which is look'd upon as the ultimate, or at least the chiefe Forme is not the Presiding, but only the Eminentest: by which I meane, not simply the *noblest* (for that were hard to determine, and according to mens Estimates would not be alwayes true) but that which in that Body is at least for the time the most *consider'd*, or if that Expression will please better we may say that sometimes the most regarded Forme is not so much the Predominating as the Denominating Forme.

IX. The *lately mention'd* Formes seem to be rather Concurrent then Subordinate.

This as I was saying followes well enough from what has been freshly discours'd. For if a Body may have divers such Conjugations of Accidents or modifications, as may intitle it in differing *respects* to differing Formes, and that Forme which is consider'd as the Eminentest

minenteſt be not a Preſiding Forme, nor ſo much as alwayes the *nobleſt*; what will remaine, but that *theſe Formes* (for I have granted above that ſome Bodies may have *Subordinate* ones) that happen to coexiſt in the ſame Body be more fitly termed Concurrent or Coincident then Subordinate?

And indeed though I cannot now ſtay to examine how farre what I ſhall ſay may be apply'd to Bodies in general, I confeſſe that, as to Inanimate Bodies, this dominion and ſubjection that is imagin'd between Formes ſeemes to me at leaſt in many caſes neither well eſtabliſh'd, nor eaſy to be well explicated. And I doubt that ſometimes we miſtake names for Things, and becauſe when a Body by the Action of proper Agents obtaines ſuch a modification as fits it for ſuch and ſuch Actions and uſes, we are wont to call it by ſuch a name, and attribute a Forme ro it, we are prone to conclude, that the Faculties and Qualifications it injoyes and the things it is able to performe are due to this Forme we have aſſign'd it; as if this Forme were ſome diſtinct and Operative ſubſtance that were put into the Body as a Boy into a Pageant, and did really begin, and guide, and overrule the motions and Actions of the *Compoſitum*. Whereas indeed what we call the Forme, if it be not ſometimes little more then

then one of thoſe Aery things that the Schools call an External Denomination, ſeems oftentimes to be rather a Metaphyſical Conception in our mind then a Phyſical Agent, that performes all things in the Body 'tis aſcrib'd to: As when a conveniently ſhap'd piece of ſteele is by having a due temper given it turn'd into the ſpring of a Watch, not only the motions of the Watch, though proceeding from this ſpring, proceed not from the Forme of the Iron (for a Spring made of another Elaſticall Body, though it would not be ſo convenient, might ſet a watch a moving) but which is here the maine obſervable, the ſpringyneſs it ſelf flowes not immediately from the Forme (for ſteele is not leſſe ſteele when 'tis not ſpringy then when 'tis) but from the mechanical and Adventitious Texture that is ſuperinduc'd in the metal, and may be given it by ſeveral outward Agents, as the Fire, the Hammer, *&c.* And 'tis ſo farre from being evident that in bodies Inanimate and Compounded the Eminenteſt and moſt conſider'd Forme muſt have a Dominion over, and an Efficacy in all Operations and Actions of the *Compoſitum*, that even in Bodies not ſo compounded it is not alwayes neceſſary that the Specifick Forme ſhould have ſo much as a Concurrent ſtroke in what is perform'd; for external Agents may introduce

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ſuch Qualities into the Body we ſpeake of, as being once there will ſuffice for actions and productions ſuitable to their own nature, whether the Forme be active in aſſiſting them or no. We ſee that boyling water taken off the Fire will raiſe Bliſters on ones hands and dreſſe meat and performe other things wont to be the Effects of the Fire, onely by vertue of the adventitious heat it has receiv'd, though according to the Peripateticks, the Forme of Water, which is an Element naturally *cold* as well as *moiſt*, ought rather to oppoſe then further the Action of the preternatural heate. Another Example to the ſame purpoſe may be given in the operations of a heated Iron taken from the fire, (nay though *that* be quite put out) to which divers other inſtances might be added. I know it may be pretended in favour of the Schools, that 'tis the Fire that was got in and yet remaines in the Iron that was the cauſe of theſe Effects. But beſides that this ſubterfuge would involve the Makers in very perplexing difficulties, I will, to prevent the Allegation, put a caſe where it cannot be pretended by ſuppoſing the Iron to be heated not by the fire, but by forcible ſtrokes between a hammer and an Anvil, both of them actually cold. When a piece of Silver is by being hammer'd or drawn into wire made to be a ſpringy Bo-

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dy; it will be able to act many things by that acquir'd Elaſticity, which do not at all flow from the Form peculiar to the metal. For not onely Copper, Steel, and many other bodies may be made ſpringy too, but if you heat it in the fire, the Gold-ſmith will aſſure you that 'tis as true and as good Silver as before; and yet it will ceaſe to be a Spring. And ſo when a Smith makes a File by making in it many little impreſſions a croſſe one another, and afterwards hardning the Steel, by virtue of this roughneſſe, which is given it by external Agents, it acquires a durable aſperity, upon whoſe account it is qualify'd to perform many and conſiderable things, whereto the Form of the metal as ſuch does not, that appears, concurre. And though the Hardneſs contribute to the making a good File, yet not onely the Iron was as true and perfect Iron before it became rough as afterwards, but even that degree of hardneſſe, which qualifies our Inſtrument to be a good File, flowes not immediately from the Form of the metal, for that was true iron when it was ſoft, and its eminent degree of hardneſſe was (as I freſhly intimated) given it by the temper it receiv'd from the Smith. I could eaſily increaſe the number of theſe inſtances, if it were neceſſary, and I ſhould here adde ſome

Examples to ſhew, that even in occult Qualities, which are ſo generally preſum'd to flow from the ſpecifick Form of a body, it is not alwaies neceſſary that this Form ſhould have any great intereſt (or perhaps any at all) in the operations, but that the Matter need but be duely excited and diſpoſ'd by outward Agents to be enabled to perform them; this, I ſay, I ſhould here make probable, were it not that ſuch Inſtances do more properly belong to our Notes about Particular and eſpecially about Occult Qualities.

But that I may at length conclude this Diſcourſe, I ſhall now in the cloſe, as I have done in ſome of the paſſages of it, complain, that the uncertain ſignification and uſe of the termes, wont to be imploy'd about the points I have been handling, are apt to occaſion much darkneſſe and difficulty in our enquiries into the things themſelves; and I am apt to think, that if the meaning of the words, *Form*, *Life*, *Soul*, *Animal*, *Vegetative*, and ſome few other termes were clearly defin'd and agreed on, a great part of the perplexing Controverſies that are agitated about ſubordinate Formes and points relatingunto them would appear to be Diſputes about Words or Termes. And I am not ſure but that *ſome* parts of the paſs'd Diſcourſe would be look'd upon as of the ſame kind too. But I have this to ſay for my ſelf, that as 'twas

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not out of choice, but a neceſſity impoſ'd upon me by the nature of my deſign that I was drawn to meddle with any controverſy, that I think may hereafter look like a verbal one; ſo if I have not miſs'd my aime; I have both diſcover'd ſome Errors and Deficiencies in the receiv'd Doctrine I took upon me to conſider, and contributed ſomething towards the future eſtabliſhing of a clearer as well as truer Theory about theſe matters.

FINIS.

ERRATA.

Pag. 44. *line ult. read* admitted. *p.* 93. *l.* 13. *r.* eminent. *p.* 94. *l.* 12. *leave out* who. *p.* 105. *l.* 9. *r.* diſſolves. *p.* 130. *l.* 1. *leave out* and. *p.* 215. *l.* 29. *r.* conſiſtent. *p.* 295. *l.* 6. *r.* bodies.